



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL MARINE FISHERIES SERVICE  
Northwest Region  
7600 Sand Point Way N.E., Bldg. 1  
Seattle, WA 98115

November 30, 2004

Mr. Stephen J. Wright  
Administrator  
Bonneville Power Administration  
P.O. Box 3621  
Portland, OR 97208-3621

Brigadier General William T. Grisoli  
Commander and Division Engineer  
U.S. Army Corps of Engineers  
Northwestern Division  
P.O. Box 2870  
Portland, OR 97208-2870

Mr. William McDonald  
Regional Director  
U.S. Bureau of Reclamation  
Pacific Northwest Region  
1150 N. Curtis Rd., Suite 100  
Boise, Idaho 83706-1234

Re: Revised 2004 Biological Opinion on the Operation of the Federal Columbia River  
Power System and 19 U.S. Bureau of Reclamation projects

Dear Mr. Wright, Brigadier General Grisoli, and Mr. McDonald,

Enclosed is the revised 2004 Biological Opinion prepared by NOAA's National Marine Fisheries Service (NOAA Fisheries) pursuant to section 7(a)(2) of the Endangered Species Act and in response to the District Court's Order dated June 2, 2003, in the case *National Wildlife Federation v. NMFS*, CR 01-640-RE. NOAA Fisheries concludes in this biological opinion that the Action Agencies' Updated Proposed Action (UPA), finalized November 24, 2004, is not likely to jeopardize twelve listed species or one proposed-to-be-listed species of Columbia basin salmonids. NOAA Fisheries also concludes that the UPA is not likely to destroy or adversely modify designated critical habitat for Snake River (SR) spring/summer chinook (*Oncorhynchus tshawytscha*), SR fall chinook (*O. tshawytscha*), or SR sockeye salmon (*O. nerka*). As required by section 7(b)(4), NOAA Fisheries also includes its Incidental Take Statement with reasonable and prudent measures and non-discretionary terms and conditions that NOAA Fisheries determines are appropriate to minimize the impact of incidental take associated with this action.



This document also includes the results of our consultation on the action's likely effects on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and its implementing regulations (50 CFR Part 600). NOAA Fisheries concludes that the proposed action may adversely affect designated EFH for Columbia basin chinook and coho salmon, English sole (*Pleuronectes vetulus*), starry flounder (*Platichthys stellatus*), the northern anchovy (*Engraulis mordax*), and the Pacific sardine (*Sardinops sagax*). As required by section 305(b)(4)(A) of the MSA, this biological opinion includes conservation recommendations that NOAA Fisheries determines will avoid, minimize, mitigate, or otherwise offset adverse effects on EFH resulting from the proposed action. As described in Chapter 11, 305(b)(5)(B) of the MSA requires that a Federal action agency must provide a detailed response in writing within 30 days of receiving NOAA Fisheries' EFH conservation recommendation.

Sincerely,

A handwritten signature in black ink, appearing to read "D. Robert Lohn", written in a cursive style.

D. Robert Lohn  
Regional Administrator

**Endangered Species Act  
Section 7(a)(2) Consultation**

**Endangered Species Act – Section 7 Consultation  
Biological Opinion**

**Consultation on Remand for Operation of the Columbia River Power System  
and 19 Bureau of Reclamation Projects in the Columbia Basin  
(Revised and reissued pursuant to court order,  
NWF v. NMFS, Civ. No. CV 01-640-RE (D. Oregon))**

Action Agencies:	U.S. Army Corps of Engineers Bonneville Power Administration U.S. Bureau of Reclamation
Consultation Conducted by:	NOAA's National Marine Fisheries Service (NOAA Fisheries) Northwest Region
NOAA Fisheries Log Number:	F/NWR/2004/00727
Date:	November 30, 2004

## TABLE OF CONTENTS

1.0	OBJECTIVES .....	1-1
1.1	Introduction .....	1-1
1.2	Application of ESA Section 7(a)(2) Standards – Jeopardy Analysis Framework ...	1-5
1.2.1	Step 1: Evaluate Current Status with Respect to Range-wide Biological Requirements and Essential Features of Critical Habitat .....	1-6
1.2.2	Step 2: Evaluate Relevance of the Environmental Baseline in the Action Area to Biological Requirements and the Current Status of the Species and Any Designated Critical Habitat .....	1-7
1.2.3	Step 3: Describe the Effects of the Proposed Action .....	1-10
1.2.4	Step 4: Describe Cumulative Effects.....	1-11
1.2.5	Step 5: Conclusion.....	1-12
2.0	BACKGROUND .....	2-1
2.1	Introduction .....	2-1
2.1.1	2000 FCRPS Biological Opinion .....	2-1
2.1.2	National Wildlife Federation v. NMFS Remand Order .....	2-1
2.1.3	Hatchery Listing Policy and Status Reviews .....	2-2
2.1.4	Redesignation of Critical Habitat .....	2-3
2.2	Current Consultation .....	2-3
2.3	Meetings with State and Tribal Representatives .....	2-4
2.4	Collaboration with Comanagers .....	2-5
2.5.1	Status of Recovery Planning .....	2-6
3.0	PROPOSED ACTION .....	3-1
3.1	Term of this Biological Opinion .....	3-1
4.0	RANGE-WIDE STATUS OF THE LISTED SPECIES.....	4-1
4.1	Introduction .....	4-1
4.2	Listed Species Affected by the Proposed Action .....	4-1
4.3	Current Range-wide Status of Listed Species Affected by the Proposed Action ...	4-3
4.3.1	SR Spring/summer Chinook Salmon .....	4-3
4.3.2	SR Fall Chinook Salmon.....	4-5
4.3.3	UCR Spring Chinook Salmon .....	4-7
4.3.4	UWR Chinook Salmon.....	4-8
4.3.5	LCR Chinook Salmon .....	4-10
4.3.6	SR Steelhead.....	4-12
4.3.7	UCR Steelhead .....	4-14
4.3.8	MCR Steelhead.....	4-16
4.3.9	UWR Steelhead .....	4-18
4.3.10	LCR Steelhead.....	4-19
4.3.11	CR Chum Salmon.....	4-20
4.3.12	SR Sockeye Salmon .....	4-22
4.3.13	LCR Coho Salmon .....	4-23

5.0	ENVIRONMENTAL BASELINE.....	5-1
5.1	Overview .....	5-1
5.1.1	Action Area .....	5-2
5.1.2	Biological Requirements and Essential Habitat Features within the Action Area .....	5-3
5.2	Summary of the Environmental Baseline.....	5-5
5.2.1	Reference Operations at Mainstem FCRPS Projects .....	5-5
5.2.2	Effects of the Existence of the FCRPS and Non-discretionary Operations .....	5-18
5.2.3	Indirect Effects of Hydrosystem Mortality on Nutrients in Tributaries ..	5-32
5.3	Non-Hydro Elements of the Baseline.....	5-34
5.3.1	Predation.....	5-34
5.3.2	Environmental Condition of the Lower Columbia River and Estuary ....	5-37
5.3.3	Mainstem Environmental Baseline .....	5-41
5.3.4	Tributary Baseline .....	5-44
5.3.5	Artificial Propagation Programs.....	5-45
5.3.6	Harvest.....	5-46
5.3.7	Population Response to Environmental Variation .....	5-50
5.4	Factors Affecting the Species' Environment in the Action Area .....	5-52
5.4.1	Snake River Spring/Summer Chinook Salmon .....	5-52
5.4.2	Snake River Fall Chinook Salmon .....	5-60
5.4.3	Upper Columbia River Spring Chinook Salmon.....	5-66
5.4.4	Upper Willamette Chinook Salmon .....	5-72
5.4.5	Lower Columbia River Chinook Salmon .....	5-73
5.4.6	Snake River Steelhead.....	5-75
5.4.7	Upper Columbia River Steelhead.....	5-80
5.4.8	Mid-Columbia River Steelhead.....	5-84
5.4.9	Upper Willamette Steelhead.....	5-93
5.4.10	Lower Columbia River Steelhead .....	5-95
5.4.11	Columbia River Chum Salmon .....	5-96
5.4.12	Snake River Sockeye Salmon.....	5-98
5.4.13	Lower Columbia River Coho Salmon .....	5-99
5.5	Adequacy of Conditions in Designated Critical Habitat .....	5-100
6.0	EFFECTS OF THE PROPOSED ACTION .....	6-1
6.1	Introduction and Methods .....	6-1
6.1.1	Methods for Evaluating Proposed Hydropower Operations and Configuration Changes.....	6-2
6.1.2	Methods for Evaluating Proposed Non-hydro Actions .....	6-4
6.1.3	Methods for Determining Net Effects of FCRPS and Non-hydro Actions.....	6-5
6.2	Results Common to Multiple ESUs .....	6-9
6.2.1	Effect of Proposed Hydro Operations on Mainstem Habitat Conditions, Including in the Estuary and Plume.....	6-9
6.2.2	Effect of Proposed Hydro Operations on Juvenile and Adult Mainstem Reach Survival .....	6-19

6.2.3	Performance Standards, Annual Reports, and Comprehensive Evaluations .....	6-26
6.3	Snake River Spring/Summer Chinook Salmon .....	6-57
6.3.1	Effect of Proposed Hydro Operations .....	6-57
6.3.2	Effect of Non-hydro Measures .....	6-62
6.3.3	Net Effect of Hydro and Non-hydro Actions .....	6-68
6.4	Snake River Fall Chinook Salmon .....	6-77
6.4.1	Effect of Proposed Hydro Operations .....	6-77
6.4.2	Effect of Non-hydro Measures .....	6-84
6.4.3	Net Effect of Hydro and Non-hydro Actions .....	6-88
6.5	Upper Columbia River Spring Chinook Salmon .....	6-91
6.5.1	Effect of Proposed Hydro Operations .....	6-91
6.5.2	Effect of Non-hydro Measures .....	6-93
6.5.3	Net Effect of Hydro and Non-hydro Actions .....	6-96
6.6	Upper Willamette Chinook Salmon .....	6-97
6.6.1	Effect of Proposed Hydro Operations .....	6-97
6.6.2	Effect of Non-hydro Measures .....	6-98
6.6.3	Net Effect of Hydro and Non-hydro Actions .....	6-99
6.7	Lower Columbia River Chinook Salmon .....	6-99
6.7.1	Effect of Proposed Hydro Operations .....	6-99
6.7.2	Effect of Non-hydro Measures .....	6-101
6.7.3	Net Effect of Hydro and Non-hydro Actions .....	6-103
6.8	Snake River Steelhead .....	6-104
6.8.1	Effect of Proposed Hydro Operations .....	6-104
6.8.2	Effect of Non-hydro Measures .....	6-107
6.8.3	Net Effect of Hydro and Non-hydro Actions .....	6-108
6.9	Upper Columbia River Steelhead .....	6-109
6.9.1	Effect of Proposed Hydro Operations .....	6-109
6.9.2	Effect of Non-hydro Measures .....	6-111
6.9.3	Net Effect of Hydro and Non-hydro Actions .....	6-115
6.10	Mid-Columbia River Steelhead .....	6-116
6.10.1	Effect of Proposed Hydro Operations .....	6-116
6.10.2	Effect of Non-hydro Measures .....	6-119
6.10.3	Net Effect of Hydro and Non-hydro Actions .....	6-123
6.11	Upper Willamette Steelhead .....	6-123
6.11.1	Effect of Proposed Hydro Operations .....	6-123
6.11.2	Effect of Non-hydro Measures .....	6-124
6.11.3	Net Effect of Hydro and Non-hydro Actions .....	6-125
6.12	Lower Columbia River Steelhead .....	6-125
6.12.1	Effect of Proposed Hydro Operations .....	6-125
6.12.2	Effect of Non-hydro Measures .....	6-127
6.12.3	Net Effect of Hydro and Non-hydro Actions .....	6-128
6.13	Columbia River Chum Salmon .....	6-129
6.13.1	Effect of Proposed Hydro Operations .....	6-129
6.13.2	Effect of Non-hydro Measures .....	6-131
6.13.3	Net Effect of Hydro and Non-hydro Actions .....	6-132

6.14	Snake River Sockeye Salmon.....	6-132
6.14.1	Effect of Proposed Hydro Operations .....	6-132
6.14.2	Effect of Non-hydro Measures .....	6-134
6.14.3	Net Effect of Hydro and Non-hydro Actions .....	6-136
6.15	Lower Columbia Coho Salmon.....	6-137
6.15.1	Effect of Proposed Hydro Operations .....	6-137
6.15.2	Effect of Non-hydro Measures .....	6-139
6.15.3	Net Effect of Hydro and Non-hydro Actions .....	6-140
7.0	CUMULATIVE EFFECTS .....	7-1
7.1	Introduction .....	7-1
7.2	Cumulative Effects Investigation .....	7-2
7.3	Cumulative Effects .....	7-4
7.3.1	Mid-Columbia River Steelhead.....	7-4
7.3.2	Upper Columbia Steelhead and Spring/Summer Chinook.....	7-7
7.3.3	Snake River Spring/Summer Chinook, Steelhead and Sockeye .....	7-9
7.3.4	Snake River Fall Chinook .....	7-11
7.3.5	Lower Columbia River Coho and Upper Willamette River Steelhead .....	7-11
7.3.6	State Managed Recreational Fisheries .....	7-12
8.0	CONCLUSIONS.....	8-1
8.1	Approach .....	8-1
8.1.1	Jeopardy Analysis.....	8-1
8.1.2	Analysis of Adverse Modification of Critical Habitat .....	8-3
8.1.3	Summary of Conclusions for All ESUs .....	8-4
8.1.4	Supplemental Consultations for USBR Projects in Occupied Habitat.....	8-4
8.2	SR Spring/summer Chinook Salmon .....	8-5
8.3	SR Fall Chinook Salmon.....	8-8
8.4	UCR Spring Chinook Salmon .....	8-14
8.5	UWR Chinook Salmon.....	8-16
8.6	LCR Chinook Salmon .....	8-18
8.7	SR Steelhead.....	8-20
8.8	UCR Steelhead .....	8-23
8.9	MCR Steelhead.....	8-25
8.10	UWR Steelhead .....	8-28
8.11	LCR Steelhead.....	8-29
8.12	CR Chum Salmon.....	8-31
8.13	SR Sockeye Salmon .....	8-33
8.14	LCR Coho Salmon .....	8-36
9.0	CONSERVATION RECOMMENDATIONS.....	9-1
9.1	Introduction .....	9-1
9.2	Subbasin Planning Infrastructure .....	9-1
9.3	Snake River Sockeye Salmon.....	9-1

10.0	INCIDENTAL TAKE STATEMENT .....	10-1
10.1	Introduction .....	10-1
10.2	Amount or Extent of Anticipated Take .....	10-1
10.2.1	Amount of Take.....	10-1
10.2.2	Hydro Juvenile Survival Performance Standard .....	10-7
10.2.3	Incidental Take Associated with Non-hydro Activities .....	10-7
10.3	Effect of the Take .....	10-8
10.4	Reasonable and Prudent Measures .....	10-8
10.4.1	Monitor Incidental Take .....	10-8
10.4.2	Reduce Incidental Take by Improving Juvenile and Adult Passage Survival .....	10-8
10.5	Terms and Conditions .....	10-8
10.5.1	Terms and Conditions Related to Monitoring Take .....	10-8
10.5.2	Terms and Conditions Related to Improving Juvenile and Adult Passage .....	10-10
11.0	MAGNUSON-STEVEN'S FISHERY CONSERVATION AND MANAGEMENT ACT .....	11-1
11.1	Background .....	11-1
11.2	Identification of EFH.....	11-2
11.3	Proposed Action .....	11-3
11.4	Effects of Proposed Action.....	11-3
11.4.1	Effects on Mainstem Habitat Conditions, Including the Estuary and Plume.....	11-4
11.4.2	Effects of Habitat Restoration Activities on Tributary and Estuarine Conditions .....	11-6
11.4.3	Effects of Predator Control on EFH .....	11-7
11.5	Conclusion.....	11-7
11.6	EFH Conservation Recommendations .....	11-8
11.7	Statutory Response Requirement .....	11-8
11.8	Supplemental Consultation.....	11-8
12.0	REINITIATION OF CONSULTATION.....	12-1
12.1	General Considerations .....	12-1
12.2	Comprehensive Evaluations and Performance Standards .....	12-1
12.2.1	Hydro Operations Juvenile Performance Standard for Comprehensive Evaluations .....	12-2
12.2.2	Hydro Operations Adult Performance Standard for Comprehensive Evaluations .....	12-2
12.2.3	Non-Hydro Performance Standards .....	12-2
12.4	Supplemental Consultations .....	12-4
13.0	LITERATURE CITED .....	13-1



## **APPENDICES**

APPENDIX A.	GEOGRAPHIC EXTENT OF DESIGNATED CRITICAL HABITAT
APPENDIX B.	ESU MAPS
APPENDIX C.	HARVEST RATES
APPENDIX D.	ANALYTICAL APPROACH, METHODS, AND BIOLOGICAL OPINION GAP ANALYSIS SURVIVAL RESULTS FOR THE SNAKE RIVER AND UPPER COLUMBIA RIVER LISTED SALMON AND STEELHEAD ESUs
APPENDIX E.	HABITAT IMPROVEMENTS AS OFFSITE MITIGATION FOR FCRPS OPERATIONS: A QUALITATIVE ASSESSMENT
APPENDIX F.	ARTIFICIAL PROPAGATION POTENTIAL AS NON-HYDRO OFFSET FOR FCRPS OPERATIONS: A SUMMARY ASSESSMENT
APPENDIX G	RESEARCH/MONITORING ACTIONS PURSUANT TO THE 2004 FCRPS BIOLOGICAL OPINION

## LIST OF TABLES

### Table #

1.1	USBR projects in the Columbia River Basin under consultation in this Biological Opinion .....	1-4
2.1	Consultation and conferencing with representatives of state and tribal governments on developments of the Draft 2004 FCRPS Biological Opinion .....	2-4
5.1	Estimated average juvenile survival rates over 1994-2003 study period through the FCRPS under the reference operation and free-flowing river conditions.....	5-30
5.2	Estimated minimum adult survival and unaccounted loss from 2000 through 2002 through the FCRPS (Bonneville Dam tailrace through John Day, Lower Granite, Priest Rapids dams) .....	5-33
5.3	Expected harvest rates to listed salmonids in winter, spring, and summer season fisheries in the mainstem Columbia River and in tributary recreational fisheries under the 2001 - 2005 Spring Agreement in U.S. v Oregon. ....	5-49
5.4	Expected harvest rates to listed salmonids in fall season fisheries in the mainstem Columbia River under the 2004 Fall Agreement in U.S. v Oregon. ....	5-50
5.5	Estimates of in-river survival for juvenile MCR steelhead .....	5-85
6.1.	Qualitative Categories for Potential Improvements in VSP Characteristics .....	6-4
6.2a.	Hypothetical examples described in terms of absolute and relative percentages .....	6-6
6.2b.	The multiplicative effect of salmonid survival through different life stages.....	6-6
6.3	Simulated average seasonal flows (and flow ranges) in thousand cubic feet per second (kcfs) for reference and proposed action operations during spring and summer time periods relevant to migrating listed juvenile salmon and steelhead for the years 1994 through 2003 .....	6-10
6.4	Estimated minimum adult survival and unaccounted loss from 2000 through 2002 through the FCRPS (Bonneville Dam tailrace through John Day, Lower Granite, Priest Rapids dams) .....	6-20
6.5	Estimated Average Juvenile and Adult Survival Rates over 1994-2003 Water Years through the FCRPS under the 2004 Proposed Hydro Operation.....	6-30
6.6	Estimated Average Juvenile and Adult Survival Rates over 1994-2003 Water Years through the FCRPS under the 2010-2014 Proposed Hydro Operation .....	6-31
6.7	Estimated Average Juvenile and Adult Survival Rates over 1994-2003 Water Years through the FCRPS under the 2010-2014 Proposed Hydro Operation .....	6-32
6.8	Summary of effects of proposed hydro operations and 2004 system configuration on listed ESUs.....	6-33
6.9	Summary of effects of discretionary hydro operations and expected 2010 system configuration improvements on listed ESUs .....	6-41
6.10	Summary of effects of discretionary hydro operations and expected 2010 system configuration improvements on listed ESUs .....	6-49
6.11	Assessment of net effect of August 30, 2004, Amended Proposed Action for most significant components. Safety-net programs reduce short-term risk of extinction for several ESUs .....	6-69
6.12	Proposed Action, Upper Columbia Spring Chinook, Wenatchee, Entiat, and Methow Subbasin .....	6-94

Table #

6.13	Proposed Action, Upper Columbia Steelhead, Wenatchee, Entiat, and Methow Subbasin.....	6-113
6.14	Proposed Conservation Measure, John Day Populations of Mid Columbia Steelhead, North Fork John Day, Middle Fork John Day, and Upper Mainstem John Day including the South Fork John Day Subbasins.....	6-121
7.1	Expected harvest rates for listed Snake River spring/summer chinook salmon in Idaho recreational fisheries.....	7-12
7.2	Authorized annual take level of ESA-listed species as a result of recreational fisheries implemented by the Washington Department of Fish and Wildlife in the Columbia River Basin upstream of Priest Rapids Dam, 2000-2004 .....	7-13
7.3	Proportional natural-origin UCR steelhead mortality take limit for recreational harvest fisheries in the Wenatchee River, Methow River, and Okanogan River basin tributary areas by run size .....	7-14
8.1	Summary of conclusions.....	8-4
10.1	Quantitative estimates of incidental take of juvenile salmonids migrating past FCRPS projects resulting from the proposed FCRPS actions .....	10-2
10.2	Estimates of incidental take of adult salmonids resulting from the proposed FCRPS hydro operations .....	10-3
10.3.	Quantitative estimates of total FCRPS passage mortality of juvenile salmonids migrating past FCRPS projects resulting from a combination of the proposed hydro operations, which include discretionary and non-discretionary operations and the existence of the dams .....	10-4
10.4.	Estimates of total FCRPS mortality of adult salmonids resulting from a combination of the proposed hydro operations, which include discretionary and non-discretionary operations and the existence of the dams .....	10-5
10.5	Annual 2003 handling mortality and tagging associated with the monitoring and evaluation program for the characteristics of the various salmon and steelhead stocks in the Columbia and Snake River basins and to provide management information for implementing flow and spill measures designed to improve fish passage conditions in the mainstem lower Snake and Columbia rivers. ....	10-6
11.1	Fish Species with EFH in the Columbia River Channel Improvement Project Action Areas (including the Deep Water Site .....	11.3

## **LIST OF FIGURES**

### **Figure**

1.1	Map of the major dams in the Columbia River basin, including major facilities that make up the Federal Columbia River Power System. ....	1-2
5.1	The action area for this consultation.....	5-4
5.2	Mean monthly Columbia River discharge (cfs) at Bonneville Dam under pre-development natural flows and under the reference operation.....	5-22
5.3	Mean monthly Columbia River discharge (cfs) at McNary Dam under pre-development natural flows and under the reference operation.....	5-23
5.4	Mean monthly Snake River discharge (cfs) at Lower Granite Dam under pre-development natural flows and under the reference operation.....	5-24
6.1	Mean monthly Snake River discharge (cfs) at Lower Granite Dam under the proposed action and under the reference operation.....	6-11
6.2	Mean monthly Columbia River discharge (cfs) at McNary Dam under the proposed action, and under the reference operation.....	6-12
6.3	Mean monthly Columbia River discharge (cfs) at Bonneville Dam under the proposed action, and under the reference operation.....	6-13

## **ACRONYMS AND ABBREVIATIONS**

Action Agencies	U. S. Bureau of Reclamation, U. S. Army Corps of Engineers, and the Bonneville Power Administration
AFEP	anadromous fish evaluation program
AFF	adult fish facilities
amsl	above mean sea level
B.C.	British Columbia
BIA	Bureau of Indian Affairs
BiOp	Biological Opinion
BLM	Bureau of Land Management
BMPs	Best Management Practices
BON	Bonneville Dam
BPA	Bonneville Power Administration
BRT	Biological Review Team (NOAA Fisheries)
CBFWA	Columbia Basin Fish and Wildlife Authority
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CHARTs	critical habitat analytical review teams
CI	confidence interval
Comanagers	States and Tribes of the Columbia River Basin
Corps	U.S. Army Corps of Engineers
CR	Columbia River
CRB	Columbia River Basin
CREP	Conservation Reserve Enhancement Program
CRFMP	Columbia River Fishery Management Plan
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
CTWSRO	Confederated Tribes of the Warm Springs Reservation of Oregon
CTWS	Confederated Tribes of the Warm Springs
CWA	Clean Water Act
CWMS	Corps Water Management System (database)
CWT	coded-wire tag
D	differential delayed survival of transported fish
DART	Data Access in Real Time (University of Washington program)
DDT	dichlorodiphenyltrichloroethane
DIP	demographically independent population
DNR	see WA DNR
EDT	ecosystem diagnosis and treatment
EEZ	Exclusive Economic Zone
EF	east fork
EFH	essential fish habitat
EIP	Ecological Improvement Potential
EIS	environmental impact statement
ENSO	El Niño Southern Oscillation

ESA	Endangered Species Act
ESBS	extended-length submersible bar screen
EST	Columbia River estuary
ESU	evolutionary significant unit
FCRPS	Federal Columbia River Power System
FFDRWG	Fish Facility Design Review Work Group
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FGE	fish guidance efficiency
FMEP	Fisheries Management and Evaluation Plan
FPE	fish passage efficiency
FPOM	Fish Passage Operations and Maintenance Coordination Team
FR	Federal Regulation
FRN	Federal Regulation Notice
FS	Forest Service
GBT	gas bubble trauma
GDU	genetic diversity unit
H	High (see Table 6.1 for description)
HCD	Habitat Conservation Division
HCP	Habitat Conservation Plan
HCY	Hell's Canyon
HGMP	hatchery and genetic management plan
HIP	Habitat Improvement Program
HSRG	Hatchery Scientific Review Group
HUC	Hydrological Unit Code
I-205	Interstate Highway 205
I-5	Interstate Highway 5
ICB-TRT	Interior Columbia Basin Technical Recovery Team
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
IHR	Ice Harbor Dam
Interior TRT	Interior Technical Recovery Team
IPER	Implementation Plan Evaluation Report
ISS	Idaho Supplementation Studies
JDA	John Day Dam
kcfs	thousand cubic feet per second
km <sup>2</sup>	square kilometers
ksfd	Thousand cubic feet per second days
L	Low (see Table 6.1 for description)
LCFRB	Lower Columbia Fish Recovery Board of the NWPCC
LCR	Lower Columbia River
LGO	Little Goose Dam
LGR	Lower Granite Dam
L-M	Low to Medium (see Table 6.1 for description)
LMN	Lower Monumental Dam

LSRCP	Lower Snake River Compensation Plan
LWD	large woody debris
Maf	million acre-feet
MCN	McNary Dam
MCR	Mid-Columbia River
MFJD	Middle Fork John Day
MHHW	mean higher high water level
mi/mi <sup>2</sup>	miles per square mile
MIP	minimum irrigation pool
MOP	minimum operating pool
MPG	major population group
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NF	north fork
NFH	National Fish Hatcheries
NFJDR	North Fork John Day River
ng/g	nanograms per gram
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
NPMP	Northern Pikeminnow Management Program
NRC	National Research Council
NWF	National Wildlife Federation
NWPCC	Northwest Power and Conservation Council
NWPPC	Northwest Power Planning Council
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
OWRD	Oregon Water Resources Department
PAH	polyaromatic hydrocarbons
PCBs	polychlorinated biphenyls
PCSRF	Pacific Coast Salmon Recovery Fund
PCTS	Public Consultation Tracking System (database)
PDO	Pacific Decadal Oscillation
PECE	“Policy for Evaluation of Conservation Efforts When Making Listing Decisions”
PFMC	Pacific Fishery Management Council
PGE	Portland General Electric
PIT	passive integrated transponder
POD	point of diversion
ppt	Parts per thousand
PUD	Public Utility District
R/S	recruits per spawner
RHCA	riparian habitat conservation area
Rkm	river kilometer
RM	river mile
RM&E	Research, Monitoring, and Evaluation
ROD	Record of Decision
RPA	Reasonable and Prudent Alternative

RPMs	reasonable and prudent measures
RSW	removable spillway weir
SAR	smolt-to-adult return rate
SASSI	Salmon and Steelhead Stock Inventory
SbyC	separated-by-code
SCT	System Configuration Team
SEF	East Fork Salmon River
SF	south fork
SFJD	South Fork John Day
SIMPAS	simulated passage (model)
SR	Snake River
SRPAH	Pahsimeroi River
SRS	sediment retention structure
SRUMA	Salmon River-Upper Mainstem
SRYFS	Salmon River-Yankee Fork
STS	submersible traveling screen
SWHA	shallow water habitat area
SWCD	Soil and Water Conservation District
SYSTDG	System Total Dissolved Gas (TDG) Model
T&C	terms and conditions
TDA	The Dalles Dam
TDG	total dissolved gas
TERP	Tower Ecosystem Restoration Projects
TMDL	total maximum daily load
TMT	Technical Management Team
TRT	Technical Recovery Team
UCM	Unit Characteristic Method
UCR	Upper Columbia River
UCUT	Upper Columbia United Tribes
UNF	Umatilla National Forest
UPA	Updated Proposed Action
URC	upper rule curve
USBR	U. S. Bureau of Reclamation
USDA	U.S. Department of Agriculture
USDA	U. S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USRC	Upper Salmon River at Challis Project
USRITAT	Upper Salmon River Interagency Technical Advisory Team
UWR	Upper Willamette River
VARQ	variable (VAR) outflow (Q)
VH	Very High (see Table 6.1 for description)
VL	Very Low (see Table 6.1 for description)
VSP	viable salmonid population
W/LC TRT	Willamette/Lower Columbia TRT



WA DNR	Washington Department of Natural Resources
WCS BRT	West Coast Salmon Biological Review Team
WDF	Washington Department of Fisheries
WDFW	Washington Department of Fish and Wildlife
WF	west fork
WQT	Water Quality Team
WRIA	water resource inventory area
YN	Yakama Nation

## 1.0 OBJECTIVES

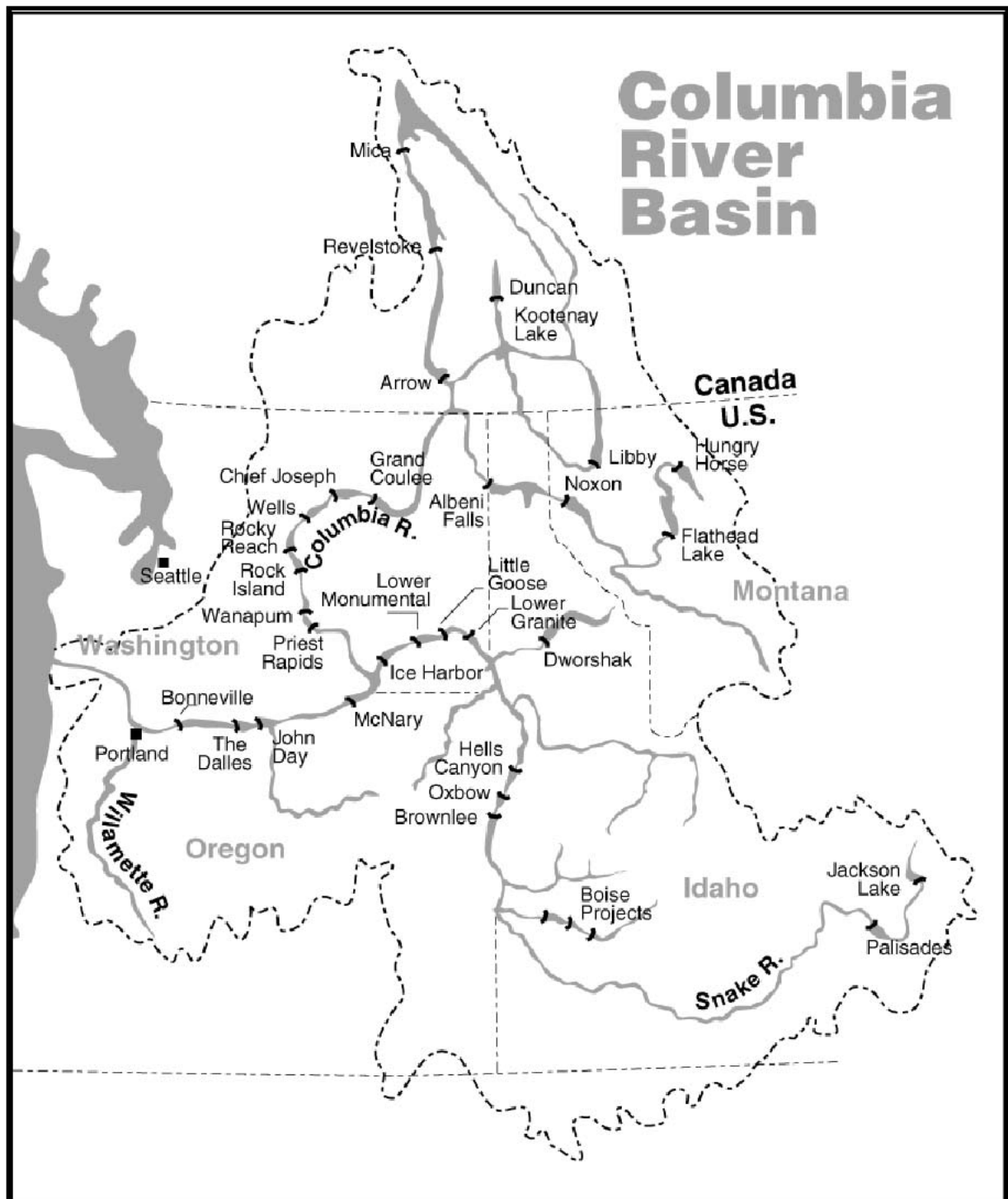
### 1.1 INTRODUCTION

The Endangered Species Act (ESA) (16 USC 1531-1544) established a national program for the conservation of threatened and endangered species of fish, wildlife, plants, and the habitat on which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service ("NOAA Fisheries"), as appropriate, to ensure that their actions are not likely to jeopardize the continued existence of species listed as endangered or threatened or to adversely modify or destroy their designated critical habitat. This is a biological opinion (Opinion) on the operation and maintenance of the Federal Columbia River Power System (FCRPS, see Figure 1.1) and 19 U.S. Bureau of Reclamation (USBR) projects and their effects on ESA-listed salmon and steelhead. It is the product of an interagency consultation pursuant to Section 7(a)(2) of the ESA and implementing regulations (50 CFR 402).

The analysis also fulfills the Essential Fish Habitat (EFH) requirements under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal fisheries management plan. Federal agencies must consult with NOAA Fisheries on all actions or proposed actions (authorized, funded, or undertaken) that may adversely affect EFH (Section 305(b)(2)).

The previous FCRPS biological opinion (hereafter referred to as the "2000 Biological Opinion") was issued on December 21, 2000, at which time NOAA Fisheries found that the action proposed by the U.S. Army Corps of Engineers (Corps), U.S. Bureau of Reclamation (USBR), and Bonneville Power Administration (BPA) (collectively, the "Action Agencies") was likely to jeopardize eight listed species of salmon and steelhead and adversely modify their designated critical habitat. NOAA Fisheries also recommended in that opinion a reasonable and prudent alternative (RPA), pursuant to ESA § 7(b)(3)(A) and 50 CFR § 402.14(h)(3). The Action Agencies subsequently decided to implement the recommended RPA through their respective records of decision. NOAA Fisheries' 2000 Biological Opinion was challenged in the case *National Wildlife Federation v. NMFS*, CR 01-640-RE (D. Oregon, filed May 5, 2001). On May 7, 2003, the District Court found the 2000 Biological Opinion invalid and remanded it to NOAA Fisheries on June 2, 2003 to consider revisions consistent with the Court's opinion of May 7, 2003. The Court also decided that the 2000 Biological Opinion should remain in effect while NOAA Fisheries and the Action Agencies developed changes in response to the Court's concerns.

**Figure 1.1.** Map of the major dams in the Columbia River basin, including major facilities that make up the Federal Columbia River Power System.



Since the Action Agencies had already adopted the measures contained in the 2000 Biological Opinion, they determined that it would be more appropriate for NOAA Fisheries to base this Opinion on an updated proposed action reflecting their current and planned future operations, rather than to reanalyze the proposed action set forth in the 1999 Biological Assessment.<sup>1</sup> Accordingly, during the consultation process, the Action Agencies developed an Updated Proposed Action (dated November 24, 2004), in which they propose to:

- Operate the 14 sets of dams, powerhouses, and reservoirs known collectively as the Federal Columbia River Power System (FCRPS). These projects are operated as a coordinated system for power production and flood control (while also effectuating other project purposes) on behalf of the Federal government under various Congressional authorities. These projects are: Dworshak, Lower Granite, Little Goose, Lower Monumental, and Ice Harbor dams, power plants, and reservoirs in the Snake River basin; Albeni Falls, Hungry Horse, Libby, Grand Coulee and Banks Lake (features of the Columbia Basin Project), and Chief Joseph dams, power plants, and reservoirs in the upper Columbia River basin; and McNary, John Day, The Dalles, and Bonneville dams, power plants, and reservoirs in the lower Columbia River basin.
- Engage in tributary and estuary habitat and hatchery improvement projects under various Congressional authorities as offsets for the unavoidable adverse effects of the FCRPS.
- Engage in scientific research and monitoring of effects on ESA-listed anadromous fish resulting from the operation of mainstem FCRPS projects on the Columbia and Snake rivers.
- USBR is also consulting on the effects of continued operation and maintenance of 19 of its projects in the Columbia River basin (Table 1.1). However, effects of the operation and maintenance of the Umatilla project have been the subject of a supplemental Section 7(a)(2) consultation, and supplemental consultation on the Yakima and Deschutes projects is expected to continue as more localized effects of those projects are identified. The Columbia Basin and Hungry Horse projects include facilities that are coordinated for multiple-use operation as part of the FCRPS. The 17 remaining projects are all operated independently but are similar to the FCRPS projects in that they have hydrologic effects on the flows of the mainstem Columbia and Snake rivers. All 19 USBR projects are authorized to provide water for irrigated agriculture, and all except Hungry Horse do so at present. USBR projects are the result of Congressional actions that provide funding and authority, beginning with the 1902 Reclamation Act and continuing with numerous other acts.

---

<sup>1</sup> The 2000 Biological Opinion also considered NOAA Fisheries' issuance of several ESA Section 10(a)(1)(A) permits, including one for the direct take of listed salmonids for the Juvenile Transportation Program. NOAA Fisheries concluded in the 2000 Biological Opinion that the issuance of these permits was not likely to jeopardize the continued existence of the affected ESUs. The Court's May 7, 2003 opinion did not identify any errors in these conclusions, and therefore there is no need to reconsider them in this Opinion. NOAA Fisheries issued the permit for the Juvenile Transportation Program on March 22, 2001, and it will expire by its terms on December 31, 2005.

USBR also operates and maintains nine “upper Snake River projects” in Eastern Oregon and Southern Idaho that are not part of this consultation, because they are the subject of a completed consultation on operation and maintenance. They are operated independently from the FCRPS for multiple uses, including the annual provision of up to 427,000 acre-feet of water for Snake River flow augmentation. The hydrologic effects of that operation are part of the environmental baseline of the FCRPS consultation through March 2005.

**Table 1.1.** USBR Projects in the Columbia River Basin under consultation in this Biological Opinion.

Project	Location	Subbasin or Stream
<b>Upper Columbia River (Upstream of Snake River Confluence)</b>		
Hungry Horse	Western Montana, north of Flathead Lake	South Fork Flat Head River
Bitterroot	Western Montana, south of Missoula	Bitterroot River
Big Flat Unit of the Missoula Valley	Western Montana, north of Missoula	Clark Fork
Frenchtown	Western Montana, north of Missoula	Clark Fork
Dalton Gardens	North Idaho, north of Coeur d'Alene	Spokane (Hayden Lake)
Avondale	North Idaho, north of Coeur d'Alene	Spokane (groundwater)
Rathdrum Prairie	North Idaho, northwest of Coeur d'Alene	Spokane (groundwater)
Spokane Valley	Eastern Washington, east of Spokane	Spokane (groundwater)
Columbia Basin	Central Washington	Columbia River
Chief Joseph Dam	North-central Washington, from Canadian border to Wenatchee	Okanogan and Columbia Rivers
Okanogan	North-central Washington, near Okanogan	Okanogan River
Yakima	Central Washington, near Yakima	Yakima River
<b>Lower Columbia (Downstream of the Snake River Confluence)</b>		
Umatilla	Northeast Oregon	Umatilla and Columbia Rivers
Crooked River	Central Oregon, north of Bend	Crooked River
Deschutes	Central Oregon, north of Bend	Deschutes River
Wapinitia	North-central Oregon, south of The Dalles	Deschutes River
The Dalles	North-central Oregon, near The Dalles	Columbia River
Tualatin	Northwest Oregon, west of Portland	Tualatin River (Willamette River)
<b>Snake River</b>		
Lewiston Orchards	West-central Idaho, near Lewiston	Clearwater River

## **1.2 APPLICATION OF ESA SECTION 7(a)(2) STANDARDS – JEOPARDY ANALYSIS FRAMEWORK**

This section reviews the approach used in this Opinion to apply the standards for determining the likelihood of jeopardy to listed species and adverse modification of critical habitat as set forth in Section 7(a)(2) of the ESA and as defined in 50 CFR Part 402 (the consultation regulations).<sup>2</sup>

This Opinion's application of authorities has been revised to specifically address the Court's concerns and other legal precedents developed since the original Opinion was issued in December 2000. In summary, the Court found that NOAA Fisheries' purported consideration of the effects of certain future Federal and non-Federal measures was inconsistent with the consultation regulations. The Court was critical of NOAA Fisheries' reference to the future effects of certain Federal measures, because the measures were not yet the subject of a completed ESA Section 7(a)(2) consultation. The Court was also critical of NOAA Fisheries' reference to the future effects of certain non-Federal actions, because NOAA Fisheries did not evaluate whether they were "reasonably certain to occur." The Court also found that NOAA Fisheries had too narrowly defined the "action area," indicating that it should have included areas affected by non-hydro mitigation required by the reasonable and prudent alternative.

To address these concerns, NOAA Fisheries was required to change the methodology for applying the Section 7(a)(2) standards from that used in the 2000 Biological Opinion. The previous analysis depended upon a prospective, range-wide evaluation of the likelihood of survival and recovery, projecting species survival rates up to 100 years in the future under reasonable scenarios of activities that would affect survival and recovery. This analysis required an estimation of the beneficial and harmful effects of future Federal and non-Federal actions. However, in performing this future estimation, NOAA Fisheries did not evaluate whether those future actions were reasonably certain to occur or (if federal) been the subject of a completed consultation. Therefore, in comparing the effects of the action with the effects of the environmental baseline in the action area in this Opinion, NOAA Fisheries has taken steps to ensure that it is not impermissibly speculating about the beneficial or harmful effects of future actions that are not reasonably certain to occur or been the subject of a completed consultation. Notwithstanding this focus, and as required by the regulations (50 CFR § 402.14(g)), the significance of any adverse effects attributable to the proposed action will be informed by the current range-wide status of the listed ESUs and the condition of designated critical habitat.

In conducting analyses of actions under Section 7 of the ESA, NOAA Fisheries takes the following steps, as directed by the consultation regulations:

1. Evaluates the current status of the species at the ESU level with respect to biological requirements indicative of survival and recovery and the essential physical and biological features of any designated critical habitat.

---

<sup>2</sup> Application of the definition in these regulations of "destruction or adverse modification" (50 CFR §402.02) is under further consideration in light of a recent court decision in this Circuit, *Gifford Pinchot Task Force v. USFWS*, No. 03-35279 (9<sup>th</sup> Cir. August 6, 2004).

2. Evaluates the relevance of the environmental baseline in the action area to biological requirements and the species' current status, as well as the status of any designated critical habitat.
3. Determines whether the proposed action reduces the abundance, productivity, or distribution of the species or alters any physical or biological features of designated critical habitat.
4. Determines and evaluates any cumulative effects within the action area.
5. Evaluates whether the effects of the proposed action, taken together with any cumulative effects and added to the environmental baseline, can be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of the affected species, or is likely to destroy or adversely modify their designated critical habitat. (See CFR § 402.14(g).)

If, in completing step 5, NOAA Fisheries determines that the action under consultation is likely to jeopardize the continued existence of ESA-listed species or adversely modify designated critical habitat, NOAA Fisheries must identify a reasonable and prudent alternative (RPA) for the action that is not likely to jeopardize the continued existence of ESA-listed species or adversely modify their designated critical habitat and meets the other regulatory requirements for an RPA (see 50 CFR § 402.02).

### **1.2.1 Step 1: Evaluate Current Status with Respect to Range-wide Biological Requirements and Essential Features of Critical Habitat**

NOAA Fisheries applies ESA Section 7(a)(2) to the listed Evolutionarily Significant Units (ESUs) of salmon and steelhead by first defining the species' range-wide biological requirements and evaluating their status relative to those requirements. The risk currently faced by each ESU informs NOAA Fisheries' determination of whether a reduction in the productivity, abundance, or distribution of the species would reasonably be expected to "appreciably reduce" the likelihood of both survival and recovery in the wild (in Step 5). The greater the current risk, the more likely that any additional risk resulting from the proposed action's effects on productivity, abundance, or distribution of the listed species will constitute an "appreciable reduction in the likelihood of both survival and recovery." Similarly, when considering whether the proposed action is likely to result in an "adverse modification" of critical habitat, the status of the ESU is also relevant.

For this Opinion, NOAA Fisheries reviewed the current status of the populations affected by the proposed action in the context of viable salmonid population (VSP) criteria<sup>3</sup> and then reviewed

---

<sup>3</sup> Pursuant to NOAA Fisheries' current recovery planning, an ESU will have achieved conditions needed for its long-term survival and recovery when a sufficient number and distribution of populations in the ESU are "viable." Viable populations are those that are large enough to safeguard the genetic diversity of the listed ESUs, enhance their capacity to adapt to various environmental conditions, and enable them to become self-sustaining in the natural environment. McElhany *et al.* (2000) describes "viable salmonid populations" (VSP) as having a negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and

the status of each major population group before reaching a conclusion for an ESU. NOAA Fisheries based this analysis on information published in its June 14, 2004 Status Review (69 FR 33102), which states the reason for proposing to continue the listing of each ESU and any other relevant information about its status that constitutes the best scientific information available. In many cases, the status of an ESU was informed by the condition of habitat necessary to meet the species' biological requirements. Habitat attributes important to the species can be described in terms of physical, chemical, and biological parameters affected by the action under consultation (Habitat Approach, NMFS 1999).

In Step 1, NOAA Fisheries also reviewed the essential features of designated critical habitat, as described in the critical habitat designations. Critical habitat is currently designated for three Snake River (SR) salmon ESUs: SR spring/summer chinook, SR fall chinook, and SR sockeye salmon (see Section 2.1.4 for the status of critical habitat designations for eight other Columbia basin ESUs).<sup>4</sup> The designations for these ESUs identify the following component areas: juvenile rearing areas, juvenile migration corridors, areas for growth and development to adulthood, adult migration corridors, and spawning areas. During these life-history stages, the fish obtain their biological requirements through access to essential features of critical habitat areas. Their biological requirements include adequate water quantity; water velocity; cover or shelter; food, air, light, minerals, or other nutritional or physiological requirements; riparian vegetation; substrate; space for population growth and normal behavior; safe passage conditions; and water quality<sup>5</sup>. These essential features of the currently designated critical habitat generally correspond to the habitat attributes that are associated with the biological requirements of all the listed species.

The definition of “destruction or adverse modification” provided by the consultation regulations directs that NOAA Fisheries evaluate whether the effects of the action cause “alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical.”

### **1.2.2 Step 2: Evaluate Relevance of the Environmental Baseline in the Action Area to Biological Requirements and the Current Status of the Species and Any Designated Critical Habitat**

In this step, NOAA Fisheries analyzes the effects of past, present, and certain future human factors within the action area to which the effects of the proposed action would be added. The environmental baseline, together with cumulative effects (Step 4), provides the starting point for evaluating whether the action would cause, directly or indirectly, a reduction in the productivity, abundance, or distribution of the listed species. Also, Steps 1 and 2 collectively

---

genetic diversity changes (random or directional) over a 100-year time frame. The attributes associated with viable salmonid populations include adequate abundance, productivity, spatial structure, and diversity. These attributes are influenced by survival, behavior, and experiences throughout the entire life cycle, and these, in turn, are influenced by habitat and other environmental conditions. NOAA Fisheries established Technical Recovery Teams (TRTs) to describe the component populations in each ESU, viability criteria for each of those populations, and the number and distribution of populations that must be viable for an ESU to attain recovery.

<sup>4</sup> The geographic extent of critical habitat designated for each of these species is described in Appendix A.

<sup>5</sup> Specifically, the water quality parameters of interest in the mainstem portion of the action area for this consultation are Total Dissolved Gas (TDG) and temperature.



inform NOAA Fisheries' determination of whether reductions in abundance, productivity, or distribution associated with effects of the proposed action would "appreciably reduce" the likelihood of both survival and recovery. The worse the status of the ESU and the greater the current risk to the species within the action area under the environmental baseline, the more likely that additional adverse effects within the action area will appreciably reduce the likelihood of the ESU's survival and recovery.

The environmental baseline includes "the past and present impacts of all Federal, State, or private actions and other human activities in the action area, including the anticipated impacts of all proposed Federal projects in the action area that have undergone Section 7 consultation and the impacts of state and private actions that are contemporaneous with the consultation in progress" (50 CFR § 402.02). For this Opinion, NOAA Fisheries' consideration of these impacts is found in Section 5.0.

Following are the steps NOAA Fisheries takes to evaluate the relevance of the environmental baseline to biological requirements and the species' current status.

#### **1.2.2.1 Define the Action Area**

The action area defines the geographic scope of the environmental baseline and cumulative effects that are relevant to a particular consultation. It includes all areas affected directly or indirectly by the Federal action, not merely the immediate area involved in the action (50 CFR § 402.02). The action area is not delineated by the migratory range of the species affected by the project. Thus, the action area would not include areas to which affected fish migrate but which are otherwise unaffected by the action. NOAA Fisheries defines the action area for this Opinion in Section 5.0.

#### **1.2.2.2 Determine Biological Requirements and Essential Habitat Features within the Action Area**

Biological requirements can be expressed as those habitat conditions or survival rates within the action area that support a sufficient number and distribution of viable populations (i.e., populations with adequate abundance, productivity, spatial structure, and diversity) necessary for the survival and recovery of the ESU. When sufficient quantitative information exists, the best available scientific information indicates that these biological requirements can be estimated as the survival rates associated with properly functioning habitat conditions.

Alternatively, where survival rates cannot be measured, the biological requirements can be discerned from conditions described in the scientific literature as fully functioning and sufficient to support salmonid survival and recovery.

Range-wide, the biological requirements of an ESU needed for its long-term survival and recovery are a sufficient number and distribution of viable populations regardless of whether the proposed action is implemented. The factors that directly influence the viability of a population, and thus are relevant for NOAA Fisheries' assessment of its status within the action area, are the habitat conditions and survival rates associated with a properly functioning salmonid habitat. For

critical habitat, they are the designated essential physical and biological features. For this Opinion, the definition of these biological requirements is in Section 5.0.

### **1.2.2.3 Evaluate the Environmental Baseline Relative to the Biological Requirements and Species Status**

The purpose of this step in the analysis is to assess the present and future “no action” conditions in the action area that would affect the listed species and critical habitat regardless of whether the proposed action is implemented. The present and future effects of the proposed action are eventually evaluated in the context of the action area environmental baseline.

Where the proposed action is a continuation of a past action, as is the case for the operation of the FCRPS, the analysis for this step is complicated, because the environmental baseline will necessarily include the effects of past actions taken to construct and operate the ongoing project. NOAA Fisheries must therefore distinguish the effects of the proposed future operation of the project from its past construction and operation. As described in more detail in Section 5.0, NOAA Fisheries made this distinction by following the fundamental principle of an ESA § 7(a)(2) consultation. Section 402.03 provides: “Section 7 and the requirements of this part apply to all actions in which there is discretionary involvement or control.” Accordingly, the ESA requires a Federal agency to consult on actions that it proposes to authorize, fund, or carry out that are within its discretionary authority. See also 50 CFR § 402.02 “*action*” and ESA § 7(a)(2). Conversely, the effects of the existing project that are beyond the current discretion of the action agency are properly part of the effects of the environmental baseline. Those effects are part of the “no action” environment to which will be added the effects of the proposed action.

Once NOAA Fisheries determined the effects of the environmental baseline, including the past effects of the FCRPS, it evaluated the significance of those effects in relation to the action-area biological requirements for the 13 ESUs<sup>6</sup> considered in this Opinion. NOAA Fisheries evaluated reach survival through the mainstem hydro corridor (i.e., over sections or the entire reach between the upper end of Lower Granite Pool and the area immediately below Bonneville Dam). These reach survival estimates were developed using the tool of a ‘reference operation’ (described in Section 5.0) and were assumed to integrate the effects of habitat condition on fish survival and condition. To determine the relevance of the environmental baseline to the biological requirements of each ESU, NOAA Fisheries compared the estimates of reach survival under the environmental baseline to estimates of reach survival associated with properly functioning habitat conditions in the mainstem reach. Where such survival rates could not be measured, NOAA Fisheries compared habitat condition in the environmental baseline to the conditions described in the scientific literature as fully functioning and sufficient to support salmonid survival and recovery.

The current status of the species and its critical habitat in the action area is indicated by the extent to which conditions under the environmental baseline fall short of the species’ biological requirements. The species’ status in the action area is important for the determinations in Step 5,

---

<sup>6</sup> Pursuant to Section 7(a)(4) of the ESA, BPA and the Corps have requested that NOAA Fisheries conference with them on the effects of hydro operations on LCR coho salmon, proposed for listing on June 14, 2004 (Wright and Grisoli 2004).

because it is more likely that any additional adverse effects caused by the proposed action will be significant if the species' status is poor and the baseline is already considerably degraded at the time of the consultation. Similarly, the status of habitat in the action area is a factor for determining whether an additional alteration of an essential feature of critical habitat would appreciably diminish the value of that critical habitat.

### **1.2.3 Step 3: Describe the Effects of the Proposed Action**

Effects of the action, to be evaluated in Step 3, are defined as “the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with the action, that will be added to the environmental baseline” (50 CFR § 402.02). Direct effects occur at a project site and may extend upstream or downstream. Indirect effects are defined in 50 CFR § 402.02 as “those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.” They include the effects on listed species of future activities that are induced by the proposed action and that occur after the action is completed. “Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration” (50 CFR § 402.02).

For the current consultation, this step involved identification and consideration of the adverse effects of the proposed discretionary operations of the FCRPS and USBR projects on the listed species and the essential features of their designated critical habitat. The proposed action also includes structural improvements to reduce mortality and non-hydro actions proposed to offset hydrosystem mortality by improving habitat conditions and survival. Finally, NOAA Fisheries evaluated the net combined effects of hydro operations and the non-hydro measures on the species and habitat.

For determining whether the action causes an alteration of an essential habitat feature that is likely to result in the destruction or adverse modification of designated critical habitat, NOAA Fisheries is using two alternative methods in the absence of a regulatory definition of this standard (see footnote #2, above.) The first method, the Environmental Baseline Approach, uses as a point of reference the environmental baseline to which the effects of the action will be added, as that term is defined by the “effects of the action” definition in the consultation regulations. If NOAA Fisheries determines that the proposed action is likely to alter an essential feature of critical habitat compared to the condition under the environmental baseline, it will then consider whether that alteration appreciably diminishes the value of critical habitat for survival or recovery. As with the jeopardy determination, this determination will be influenced by the status of the ESU and the degree to which existing environmental baseline conditions of the affected essential features meet the biological requirements of the species for survival or recovery.

As an alternative to this analysis of the § 7(a)(2) critical habitat standard, NOAA Fisheries will use the Listing Conditions Approach. To determine if the proposed action adversely alters an essential feature of critical habitat, NOAA Fisheries will alternatively refer to the condition of the essential feature (also known as a “primary constituent element,” or PCE) as it existed at the

time the species was listed.<sup>7</sup> The essential feature will have been altered if the action reduces its function below that which existed at the time of listing. As with the first alternative, if there is an alteration of an essential feature of critical habitat compared to this reference point, then NOAA Fisheries will consider whether the alteration appreciably diminishes the value of critical habitat for survival or recovery. This determination will be influenced by the status of the ESU and the degree to which reference conditions for the affected essential feature at the time of listing met the biological requirements of the species for survival or recovery.

#### 1.2.4 Step 4: Describe Cumulative Effects

The cumulative effects analysis in Step 4 requires NOAA Fisheries to evaluate the future beneficial or harmful effects of those state or private activities (not including Federal activities) that are reasonably certain to occur in the action area.<sup>8</sup> Indicators that actions are reasonably certain to occur may include but are not limited to approval of the action by state, Tribal, or local agencies or governments (e.g., permits, grants); indications by state, Tribal, or local agencies or governments that granting authority for the action is imminent; a project sponsor's assurance that the action will proceed; obligation of venture capital; or initiation of contracts (USFWS and NOAA Fisheries 1998). At the same time, 'reasonably certain to occur' does not require a guarantee that the action will occur. However, the more state, Tribal, or local administrative discretion that remains to be exercised before a non-Federal action can proceed, the less NOAA Fisheries can be reasonably certain that the project will be authorized. Similarly, the more economic, administrative, and legal hurdles that remain to be cleared, the less NOAA Fisheries can be reasonably certain the project will proceed. For this Opinion, non-Federal actions that could not meet these standards were not included in the "cumulative effects" analysis.

Potential cumulative effects considered in this Opinion were identified in collaboration with states and Tribes that co-manage Columbia basin fisheries resources. NOAA Fisheries assessed whether the net impact of any cumulative effect would be to improve or degrade the baseline and estimated, to the extent practical, the magnitude of any change. If the status of the environmental baseline was very poor, but a suite of "reasonably certain to occur" actions was identified from which beneficial cumulative effects were likely, NOAA Fisheries tolerated a greater adverse effect from the proposed action before adjudging it an "appreciable reduction." By the same token, expected harmful cumulative effects from "reasonably certain to occur" actions reduced the tolerance level.

---

<sup>7</sup> Critical habitat" is statutorily defined to include "the specific areas within the geographic area occupied by the species, at the time it is listed .... on which *are found* those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection." Since the physical or biological features that comprise the critical habitat were presumably present at the time of listing, the condition of the habitat at the time of listing can be used as a benchmark to determine whether the proposed action is likely to adversely modify those previously present features.

<sup>8</sup> The past and present effects of non-Federal actions are part of the environmental baseline. The future effects of future Federal activities are part of the environmental baseline, provided they have undergone ESA Section 7 consultation.

### **1.2.5 Step 5: Conclusion**

NOAA Fisheries determined whether it was reasonable to expect that the net effects of the action, when added to the effects of the “environmental baseline,” and “cumulative effects” in the action area would, directly or indirectly, appreciably reduce the likelihood of both the survival and recovery of the listed species or result in the destruction or adverse modification of designated critical habitat (50 CFR § 402.14(g)). As described above, the biological requirements and current status were the relevant factors indicative of the likelihood of survival and recovery.

If, in Step 3, NOAA Fisheries determines that the proposed action would either not affect or would result in a net improvement in survival or habitat condition for a given ESU, NOAA Fisheries would conclude that the action is not likely to jeopardize that ESU or adversely modify critical habitat. Because there would be no net reduction in the productivity, abundance or distribution of the ESU, there could not be an appreciable reduction in the likelihood of both survival and recovery in accordance with the regulatory definition of “jeopardize the continued existence of” (50 CFR § 402.02).

If NOAA Fisheries determines in Step 3 that the proposed action would reduce the abundance, productivity, or distribution of a given ESU compared to the environmental baseline, NOAA Fisheries then determines whether that reduction constitutes an appreciable reduction in the likelihood of survival and recovery. If so, NOAA Fisheries would conclude that the action would be likely to jeopardize the continued existence of listed species. This decision depends upon the magnitude of the reduction, the distribution of that reduction among component populations and major population groups within an ESU, the risk experienced by the ESU, both over its range and within the action area, and the amount of uncertainty presented by the data and scientific analysis available.

If NOAA Fisheries determines in Step 3 that the proposed action alters an essential feature of designated critical habitat compared to either of the two reference points (either the environmental baseline or the condition of the habitat at the time of listing), NOAA Fisheries then evaluates whether the alteration constitutes a destruction or adverse modification of designated critical habitat.

In determining whether an alteration of an essential feature of critical habitat compared to either of the reference points appreciably diminishes the value of critical habitat for survival or recovery, NOAA Fisheries considers the magnitude and duration of the alteration, the condition of critical habitat in the action area under the environmental baseline and cumulative effects, the purpose of the affected essential feature for survival and recovery, the status of the ESU across its range and within the action area, and the amount of uncertainty presented by the data and scientific analysis available.

If NOAA Fisheries determines that the proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat, it must, if possible, identify a reasonable and prudent alternative to the proposed action that would avoid these effects.

## 2.0 BACKGROUND

### 2.1 INTRODUCTION

#### 2.1.1 2000 FCRPS Biological Opinion

NOAA Fisheries issued the 2000 FCRPS Biological Opinion on December 21, 2000, at which time NOAA Fisheries found that the action proposed by the Action Agencies in their 1999 Biological Assessment was likely to jeopardize eight listed species of Columbia Basin salmon and steelhead and their designated critical habitats. NOAA Fisheries also recommended a reasonable and prudent alternative (RPA), pursuant to ESA § 7(b)(3)(A) and 50 CFR § 402.14(h)(3). The Action Agencies subsequently decided to implement the recommended RPA through their respective decision documents.

The RPA recommended an adaptive management framework for planning and implementing a program of operations at the FCRPS projects, a program of non-hydro offsets, and a program of research, monitoring, and evaluation necessary to ensure that the FCRPS continued to meet the requirements of Section 7(a)(2) of the ESA for ten years. The RPA proposed a suite of 199 default actions to be implemented by the Action Agencies with the understanding that alternative actions could be substituted for the default actions through the planning framework provided they were at least equally as effective as the default action they replaced. Further, the RPA recommended performance expectations and regular reporting to ensure that the ESA standards were met throughout the ten-year period.

Since implementation of the 2000 Biological Opinion began in 2001, the Action Agencies have documented and explained a number of adjustments to initial RPA actions in their annual implementation plans and progress reports. These revisions have been evaluated by NOAA Fisheries and documented in its annual findings letters. For example, some actions have been completed, some have been modified, some have been better defined, and some have been augmented. As a result, the precise wording of the 199 RPA actions is not the most current or accurate description of hydrosystem operations or non-hydro offsets called for by NOAA Fisheries' 2000 RPA.

#### 2.1.2 National Wildlife Federation v. NMFS Remand Order

NOAA Fisheries' 2000 Biological Opinion was challenged in the case *National Wildlife Federation v. NMFS*, CR 01-640-RE (D. Oregon, *filed* May 5, 2001). On May 7, 2003, District Court Judge James A. Redden found the 2000 Biological Opinion invalid, and he remanded that biological opinion to NOAA Fisheries on June 2, 2003 to consider revisions consistent with his Opinion of May 7, 2003. The Court also decided that the 2000 Biological Opinion should remain in effect while NOAA Fisheries and the Action Agencies developed changes in response to the Court's concerns.

“ . . . [T]he court agrees with NOAA Fisheries and the State of Oregon that remand is appropriate in order to give NOAA Fisheries the opportunity to

consult with interested parties to insure that only those range-wide non-hydro Federal non-hydro offsetting actions which have undergone section 7 consultation, and range-wide non-hydro non-Federal offsetting actions that are reasonably certain to occur, are considered in the determination whether any of the 12 salmon ESUs will be jeopardized by continued FCRPS operations.” May 7, 2003, Opinion and Order, p. 25.

NOAA Fisheries developed this biological opinion with the goal of fully complying with the Court’s Opinion and Order of May 7, 2003.

### 2.1.3 Hatchery Listing Policy and Status Reviews

In a September 12, 2001 order in *Alsea Valley Alliance v. Evans*, Judge Michael R. Hogan of the U.S. District Court in Eugene, Oregon found NOAA Fisheries’ definition of an ESU to be a permissible interpretation of “distinct population segment” for salmon. However, the Court determined that when NOAA Fisheries finds that an ESU includes both hatchery and naturally spawned fish, the agency may not permissibly list only the naturally spawned fish as threatened or endangered under the ESA. On these grounds, the Court set aside NOAA Fisheries’ 1998 ESA listing of Oregon Coast coho salmon.

In response to the *Alsea* decision, NOAA Fisheries has conducted a review to examine how the logic of the *Alsea* decision should be applied to those ESUs that include fish reared in hatcheries. This review entailed development of methods to determine which hatchery fish are part of the same ESU as naturally spawned fish and how the existence of ESU hatchery fish and their interactions with natural populations affect the prospects for survival of the entire ESU. The review was also extended to address the relationship of resident *O. mykiss* (rainbow or redband trout) to anadromous *O. mykiss* (steelhead) within the same ESU. NOAA Fisheries’ Biological Review Team (BRT) prepared a draft report on the updated status of 26 ESA-listed ESUs and one candidate species ESU of salmon and steelhead. This draft report was circulated for technical review and comments by state, Tribal, and Federal Comanagers. The final report, dated July 2003, can be accessed at [www.nwr.NOAA.gov/AlseaResponse/20040528/index.html](http://www.nwr.NOAA.gov/AlseaResponse/20040528/index.html).

NOAA Fisheries published its proposed hatchery listing policy in the *Federal Register* on June 3, 2004 (69 FR 31354) and its proposed rule to revise the listing status of 25 currently listed Pacific salmonid ESUs and to list two additional ESUs (including Oregon Coast coho) on June 14, 2004 (69 FR 33102). These proposals include listing of over 100 hatchery populations of salmon and steelhead and the listing of some resident rainbow trout. The original 90-day public comment periods on these proposals were to end on September 1, 2004 for the proposed hatchery listing policy and September 13, 2004 for the proposed listing rule. NOAA Fisheries extended the comment periods for both proposals until November 12, 2004. Additional information, including details on public meetings, can be found at: <http://www.nwr.NOAA.gov/AlseaResponse/20040528/ltrstkhldrs.pdf>. NOAA Fisheries must make final decisions on the proposed listing rule by June 14, 2005. Promptly thereafter, notice of those decisions and rules will be sent to the *Federal Register* for publication. NOAA Fisheries expects to adopt a final hatchery listing policy several months before issuing the final listing revisions rule. NOAA Fisheries will use that final policy in making its final listing decisions.

#### **2.1.4 Redesignation of Critical Habitat**

Critical habitat had been designated for 12 of the species of salmon and steelhead considered in this opinion. However, on April 30, 2002, the United States District Court for the District of Columbia adopted a consent decree resolving the claims in *National Homebuilders, et al. v. Evans*, Civil Action No. 00-2799 (CKK) (D.D.C., April 30, 2002). Pursuant to that consent decree, the court issued an order vacating critical habitat designations for a number of listed salmonid species, including UCR spring chinook and steelhead, SR steelhead, MCR steelhead, UWR chinook and steelhead, LCR chinook and steelhead, and CR chum salmon. NOAA is in the process of completing new critical habitat designations, which are expected to be proposed on November 30, 2004.

### **2.2 CURRENT CONSULTATION**

NOAA Fisheries and the Action Agencies intend that this Biological Opinion and the Updated Proposed Action it evaluates will replace the 2000 FCRPS Biological Opinion and its Reasonable and Prudent Alternative (RPA). This is the outcome of a process that began over a year and a half ago when the Court, in *NWF v. NMFS*, discussed above, determined that the 2000 Opinion was flawed. NOAA Fisheries initially embarked on the court-ordered year long remand to address the Court's concerns about NOAA Fisheries' reliance on certain future actions and to reconsider the jeopardy analysis for the FCRPS that would be consistent with the Court's interpretation of the consultation regulations. See, Federal Defendant's First Quarterly Status Report, p. 2 (10/1/03).

Seven months after NOAA Fisheries undertook the review of its Opinion pursuant to the remand, the states and tribes proposed a collaborative process to discuss technical issues as well as the analytical framework for reaching determinations about jeopardy. For four months in the winter and spring of 2004, NOAA Fisheries participated in nineteen facilitated sessions with state and tribal representatives and other interested parties, in which the participants discussed the intrinsic potential of habitat, effects of hatchery operations, effects of FCRPS operations, population trends, and the analytical framework for ESA jeopardy determinations.

In recognition of the time and effort committed to the collaborative process, the Court extended the remand until November 30, 2004, and the issuance of this biological opinion. On September 8, 2004, NOAA Fisheries released a draft of this biological opinion for co-manager review. The Action Agencies released a draft of their Updated Proposed Action at the same time. NOAA Fisheries received over 46,000 separate comments on its draft Opinion including detailed comments from each of the Columbia Basin states and tribes, which also have management responsibilities for salmon.

NOAA Fisheries and the Action Agencies embarked on this remand with the expectation that they would build upon the RPA of the 2000 Opinion for the purpose of responding to the Court's concerns. The Action Agencies' UPA was therefore developed with the RPA as its starting point. The similarities and differences between the UPA and the RPA can be found in the RPA Crosswalk posted at [www.salmonrecovery.gov](http://www.salmonrecovery.gov). These significant changes were necessary to address the Court's interpretation of the ESA consultation regulations, recently available



scientific data, and new information about specific operations, modifications, and non-hydro projects. Recent developments in ESA caselaw also necessitated further revisions from the 2000 Opinion, such as the analysis of effects on designated critical habitat. For these reasons, this 2004 Biological Opinion and the 2004 UPA supercede all previous consultations for the FCRPS.

## 2.3 MEETINGS WITH STATE AND TRIBAL REPRESENTATIVES

After issuing the State/Tribal Review Draft of this Opinion on September 8, 2004, staff of NOAA Fisheries Hydropower, Salmon Recovery, and Habitat Conservation divisions met with state and Tribal technical and policy staff on September 13, 15, and 16, 2004. The purpose of these meetings was to provide an overview and to answer questions, thus facilitating the Comanagers' review of the draft Opinion. Secondly, the meetings were expected help the participants brief their policy counterparts, in preparation for the policy-level meetings scheduled in early October. Action Agency staff also participated in the meetings and provided information on their Updated Proposed Action. Dates and locations of the staff- and policy-level meetings are shown in Table 2.1.

**Table 2.1.** Consultation and conferencing with representatives of state and tribal governments on development of the 2004 FCRPS Biological Opinion.

Date	Location	Affiliations
September 13, 2004	Upper Columbia United Tribes (UCUT) Office, Spokane, WA	Kalispel Tribe, Spokane Tribe, Confederated Tribes of the Colville Reservation, Kootenai Tribe of Idaho, Coeur d'Alene Tribe of Idaho, UCUT staff
September 15, 2004	NOAA Fisheries Office, Boise, ID	Shoshone-Bannock Tribes of Ft. Hall, Shoshone-Paiute Tribes of Duck Valley
September 16, 2004	NOAA Fisheries Office, Portland, OR	Implementation Team – including representatives of Montana, Idaho, Oregon, Nez Perce Tribe of Idaho, Columbia Basin Fish and Wildlife Authority, Save Our Wild Salmon, Pacific Northwest Utilities Conference Committee, Northwest Power and Conservation Council, PNGC Power, and Fish Passage Center
October 5, 2004	NOAA Fisheries Office, Portland, OR	Representatives of the Governors' Offices of the States of Idaho, Montana, Oregon, and Washington
October 8, 2004	Red Lion Inn, Portland, OR	Shoshone-Bannock Tribes, Confederated Tribes of the Warm Springs Reservation of Oregon, Columbia River Inter-tribal Fish Commission, Yakama Nation, Umatilla Tribes
October 15, 2004	Red Lion Inn at the Park, Spokane, WA	Coeur d'Alene Tribe of Idaho, Confederated Tribes of the Colville Reservation, Confederated Tribes of the Warm Springs Reservation of Oregon

## 2.4 COLLABORATION WITH COMANAGERS

In January 2004, the parties to *National Wildlife Federation et al. v. National Marine Fisheries Service* agreed to embark on a collaborative process proposed by the Comanagers. The process included three stages: (1) scoping of issues; (2) Comanager review of data; and (3) workshops for discussion of questions, concerns, and suggestions arising from that review. The professional facilitation firm, DS Consulting, was hired to plan meetings, facilitate discussions, and provide written workshop summaries.

The process began on February 12, 2004 at a joint Steering Committee meeting, where the group agreed to five specific areas for discussion: intrinsic potential of habitat; hatcheries; hydro operations and actions, including effects, the estuary, and dam passage; population trends; and the analytical framework. Representatives from the Comanagers' agencies interacted with NOAA Fisheries representatives in sessions held between February and May of 2004. These sessions were also attended by Action Agency representatives and plaintiff and defendant observers.

## 2.5 RECOVERY PLANNING

Section 4(f) of the ESA directs NOAA Fisheries to develop and implement recovery plans for the ESUs addressed in this Opinion. "To the maximum extent practicable" each plan shall incorporate:

- Site-specific actions necessary to achieve goals for conservation and survival.
- Objective measurable criteria for delisting the species.
- Estimates of the time and cost for implementing the recovery plan.

While NOAA Fisheries is legally responsible for developing and implementing recovery plans, Section 7(a)(1) of the ESA directs all Federal agencies, in consultation with NOAA Fisheries, to "utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species..." NOAA Fisheries is coordinating work with other Federal agencies through the Federal Caucus.

NOAA Fisheries and the Action Agencies believe that the plans will have a greater likelihood of success if developed in partnership with other stakeholders, including those that have the responsibility and authority to implement recovery actions. Current efforts that will provide a strong foundation for ESA recovery plans in the Columbia River basin include the Northwest Power and Conservation Council's subbasin plans and the State of Washington's regional recovery plans. NOAA Fisheries is assisting Council subbasin planning and State of Washington recovery planning groups as they develop assessments, strategies, and actions. Initial drafts of subbasin plans have addressed primarily habitat issues, and NOAA Fisheries is working with local, state, and Tribal organizations to integrate hatchery, harvest, and hydro issues into the plans (as described below).

As recovery plans are developed and finalized, they will take into account biological opinions, Habitat Conservation Plans (HCPs), Federal Energy Regulatory Commission (FERC) license agreements, settlement agreements resulting from litigation (e.g., *U.S. v. Oregon* and *U.S. v. Washington*), and other existing arrangements. Once completed, the recovery plans are intended to provide a roadmap to recovery. They will provide a context for future biological opinions, HCPs, FERC license renewals, and other actions. They are intended to help organize, coordinate, and prioritize recovery actions to achieve biological goals in the most effective and efficient manner possible.

### **2.5.1 Status of Recovery Planning**

NOAA Fisheries expects draft recovery plans for all listed Columbia basin ESUs that spawn and rear in the State of Washington to be written by June 2005. The first draft State of Washington regional recovery plan will be available from the Lower Columbia Fish Recovery Board in December 2004. Assuming that the plans are consistent with guidance endorsed by NOAA Fisheries, including the State of Washington's Salmon Recovery Plan Model and the Northwest Power and Conservation Council's Technical Guide, NOAA Fisheries expects to endorse them as "Interim Local Recovery Plans." These plans are "interim," because they may require the addition of elements for hydro, hatchery, and harvest actions (i.e., some of the Washington Recovery Boards have indicated that they may only address habitat actions) and may need components developed for populations in Oregon and Idaho. Washington's regional recovery boards have been coordinating with both Columbia basin TRTs, and it appears that their recovery plans will address TRT viability recommendations. NOAA Fisheries intends to formalize these interim plans as ESA recovery plans as soon as possible. The status and timing of recovery plans for portions of ESUs in Oregon and Idaho is less clear. NOAA Fisheries intends draft plans to be developed, to the extent possible, for the "bi-state" mid-Columbia steelhead and "tri-state" (Snake River spring/summer chinook, fall chinook, steelhead, and sockeye) ESUs by December 2005.

### **3.0 PROPOSED ACTION**

As discussed in Section 1.0, NOAA Fisheries' purpose in this Opinion is to reconsider the methodology and conclusion in its 2000 Biological Opinion that the recommended reasonable and prudent alternative (RPA) was sufficient to satisfy the requirements of ESA § 7(a)(2). This reconsideration is responsive to an order of remand issued on June 2, 2003 by District Court Judge James A. Redden in the case *National Wildlife Federation v. NMFS*, CR 01-640-RE (D. Oregon, filed May 5, 2001).

To lay the groundwork for its new draft Opinion in response to the judicial remand, NOAA Fisheries revised its jeopardy analysis and updated its consideration of available science for listed salmon and steelhead. Based on this new information, the Action Agencies prepared an Updated Proposed Action (UPA) for NOAA Fisheries' consideration. To a large extent, the UPA continues the implementation of many of the actions contained in the 2000 Biological Opinion. It continues to focus on actions that will contribute toward meeting the performance standards described in the 2000 Biological Opinion but also includes specific actions designed to address the new jeopardy analysis, available science, and remand directions from the court.

Since the 2000 Biological Opinion was issued, the region has also gathered additional scientific information about the survival benefits available from certain types of actions. For example, NOAA Fisheries has identified factors that limit ESU survival in the tributaries and the estuary. The 2000 Biological Opinion and the associated Reasonable and Prudent Alternative (RPA) did not identify actions that were needed to avoid jeopardy for each of the ESUs to the level of detail now possible. NOAA Fisheries' updated analysis now includes ESU-specific survival needs. In consideration of these analyses, this UPA presents a customized approach to the life-stage needs of each ESU.

The UPA continues most of the uncompleted and ongoing actions in the 2000 Biological Opinion. It refines the actions of the RPA into a new set of Federal actions based on adaptive management principles. The similarities and differences between the UPA and the 2000 RPA can be found in the RPA Crosswalk posted at [www.salmonrecovery.gov](http://www.salmonrecovery.gov). As in the 2000 Biological Opinion, the UPA includes processes to assess and report progress and implementation planning.

The Action Agencies' proposed action is described in their November 24, 2004 "Updated Proposed Action for the FCRPS Biological Opinion Remand," which is incorporated by reference for the purpose of this Biological Opinion.

#### **3.1 TERM OF THIS BIOLOGICAL OPINION**

The term of this biological opinion covers the activities set forth in the Action Agencies' August 30, 2004 "Updated Proposed Action for the FCRPS Biological Opinion Remand." As such, this Opinion covers all of the Action Agencies' proposed discretionary operations of the FCRPS, associated projects, and coincident mitigation actions through 2014. The term is extended beyond 2010 in order to include one activity that is expected to be phased in through

2014 (the testing and planned construction of improved bypass systems, such as removable spillway weirs at Lower Monumental, Little Goose, McNary, and John Day dams).

## 4.0 RANGE-WIDE STATUS OF THE LISTED SPECIES

### 4.1 INTRODUCTION

The first step NOAA Fisheries takes when applying the ESA Section 7(a)(2) to the listed ESUs considered in this biological opinion is to define each ESU's biological requirements and evaluate its range-wide status relative to those biological requirements. Biological requirements are defined in Section 5.4. The range-wide status of each of the listed ESUs considered in this Opinion is summarized in the following sections.

### 4.2 LISTED SPECIES AFFECTED BY THE PROPOSED ACTION

This consultation considers whether the effects of the proposed actions are likely to jeopardize the continued existence of 12 listed and one proposed species of Columbia basin salmonids or cause the destruction or adverse modification of their designated critical habitat. The 13 species are:

- Snake River (SR) spring/summer chinook salmon (*Oncorhynchus tshawytscha*; listed as threatened on April 22, 1992 [57 FR 14653]); critical habitat designated on December 28, 1993 [58 FR 68543], and revised on October 25, 1999 [64 FR 57399].
- Snake River (SR) fall chinook salmon (*O. tshawytscha*; listed as threatened on April 22, 1992 [57 FR 14653]); critical habitat designated on December 28, 1993 [58 FR 68543].
- Upper Columbia River (UCR) spring chinook salmon (*O. tshawytscha*; listed as endangered on March 24, 1999 [64 FR 14308]); critical habitat designated on February 16, 2000 [65 FR 7764], but vacated by court order on April 30, 2002.<sup>1</sup>
- Upper Willamette River (UWR) chinook salmon (*O. tshawytscha*; listed as threatened on March 24, 1999 [64 FR 14308]); critical habitat designated on February 16, 2000 [65 FR 7764], but vacated by court order on April 30, 2002.
- Lower Columbia River (LCR) chinook salmon (*O. tshawytscha*; listed as threatened on March 24, 1999 [64 FR 14308]); critical habitat designated on February 16, 2000 [65 FR 7764], but vacated by court order on April 30, 2002.

---

<sup>1</sup> Critical habitat had been designated for 12 of the species of salmon and steelhead considered in this opinion. However, on April 30, 2002, the United States District Court for the District of Columbia adopted a consent decree resolving the claims in National Homebuilders, *et al.* v. Evans, Civil Action No. 00-2799 (CKK)(D.D.C., April 30, 2002). Pursuant to that consent decree, the court issued an order vacating critical habitat designations for a number of listed salmonid species, including UCR spring chinook and steelhead, SR steelhead, MCR steelhead, UWR chinook and steelhead, LCR chinook and steelhead, and CR chum salmon. For this reason, the proposed action can only affect designated critical habitat for SR spring/summer chinook salmon, SR fall chinook salmon, and SR sockeye salmon. Thus, this opinion will not determine whether the proposed action is likely to result in the destruction or adverse modification of any critical habitat for 10 of 13 ESUs.

- Snake River (SR) steelhead (*O. mykiss*); listed as threatened on August 18, 1997 ([62 FR 43937]); critical habitat designated on February 16, 2000 [65 FR 7764], but vacated by court order on April 30, 2002.
- Upper Columbia River (UCR) steelhead (*O. mykiss*); listed as endangered on August 18, 1997 [62 FR 43937]; critical habitat designated on February 16, 2000 [65 FR 7764], but vacated by court order on April 30, 2002.
- Middle Columbia River (MCR) steelhead (*O. mykiss*); listed as threatened on March 25, 1999 [64 FR 14517]; critical habitat designated on February 16, 2000 [65 FR 7764], but vacated by court order on April 30, 2002.
- Upper Willamette River (UWR) steelhead (*O. mykiss*); listed as threatened on March 25, 1999 [64 FR 14517]; critical habitat designated on February 16, 2000 [65 FR 7764], but vacated by court order on April 30, 2002.
- Lower Columbia River (LCR) steelhead (*O. mykiss*); listed as threatened on March 19, 1998 [63 FR 13347]; critical habitat designated on February 16, 2000 [65 FR 7764], but vacated by court order on April 30, 2002.
- Columbia River (CR) chum salmon (*O. keta*); listed as threatened on March 25, 1999 [64 FR 14508]; critical habitat designated on February 16, 2000 [65 FR 7764], but vacated by court order on April 30, 2002.
- Snake River (SR) sockeye salmon (*O. nerka*); listed as endangered on November 20, 1991 [56 FR 58619]; critical habitat designated on December 28, 1993 [58 FR 68543].
- Lower Columbia River coho salmon (*O. kisutch*); proposed for listing as threatened on June 14, 2004 [69 FR 33102].

On June 14, 2004, NOAA Fisheries published its proposed ESU listing determinations for Pacific salmon and steelhead in the Federal Register in response to the *Alsea* decision (hereafter “2004 Status Review,” Section 2.1.3). Of the 12 ESUs considered in the 2000 Opinion, NOAA Fisheries has proposed a change in status only for UCR steelhead (from endangered to threatened). Also, NOAA Fisheries proposes to add over 100 hatchery populations and resident populations of *O. mykiss*.

The June 14, 2004 Federal Register Notice also included a proposal to list Lower Columbia River (LCR) coho salmon (*O. kisutch*) as threatened. The ESA requires that the Action Agencies confer with NOAA Fisheries on any agency action that is likely to jeopardize the continued existence of any species proposed to be listed or result in the destruction or adverse modification of critical habitat proposed to be designated for such species (ESA § 7(a)(4)). As indicated, with one exception, NOAA Fisheries is proposing a revision to a current listing rather than a new listing proposal. The Action Agencies have requested consultation on the current listings. They have not requested conferencing on the revision, and NOAA Fisheries concurs that conferencing is not required in addition to the present consultation on the existing listings. For the one ESU

that NOAA Fisheries is presently proposing to list (Lower Columbia River coho), a conference is similarly unnecessary, given that the Opinion concludes that the proposed action is not likely to jeopardize the continued existence of this ESU.

Although the listing determinations will not be finalized until after the period of this remand, NOAA Fisheries uses the same information in this chapter as in the proposed listing determinations, because this is currently the best available scientific and commercial information on range-wide status.

### **4.3 CURRENT RANGE-WIDE STATUS OF LISTED SPECIES AFFECTED BY THE PROPOSED ACTION**

Before NOAA Fisheries assesses the current status of the listed species within the action area, it reviews the reasons it decided that those species should be listed for ESA protection. It also considers any new data relevant to those determinations. The listing status, general life history, and population dynamics of each species are described in detail in the 2004 Status Review. These data are summarized in the following sections, along with more recent dam and spawner counts for the years after 2001, where available, and updated population trends.

#### Consideration of Recent Ocean Conditions in the Listing Determinations

In the last decade, evidence has shown recurring, decadal-scale patterns of ocean-atmosphere climate variability in the North Pacific Ocean. These oceanic productivity “regimes” have correlated with salmon population abundance in the Pacific Northwest and Alaska. Survival rates in the marine environment are strong determinants of population abundance for Pacific salmon and steelhead. However, because the confidence with which ocean-climate regimes can be predicted into the future is limited, man’s ability to project the future influence of ocean-climate conditions on salmonid productivity is limited. Even under the most optimistic scenario, increases in abundance might be only temporary and could mask a failure to address underlying factors for decline. It is reasonable to assume that salmon populations have persisted over time under pristine conditions through many such cycles in the past. Less certain is how the populations will fare in periods of poor ocean survival when their freshwater, estuary, and nearshore marine habitats are degraded.

#### **4.3.1 SR Spring/summer Chinook Salmon**

##### **4.3.1.1 ESU Structure**

Based on genetic and geographic considerations, the Interior Technical Review Team (TRT 2003) established five major population groups in this ESU: the Lower Snake River Tributaries, the Grande Ronde and Imnaha rivers, the South Fork Salmon River, the Middle Fork Salmon River, and the upper Salmon River. The Interior TRT further subdivided these groupings into a total of 31 extant, demographically independent populations (Appendix B, Figure B.1). However, chinook salmon have been extirpated from the Snake River and its tributaries above Hells Canyon Dam, an area that encompassed about 50% of the pre-European spawning areas in the Snake River basin (NRC 1996). Major subbasins in the Clearwater were blocked to chinook



in 1927 by the Lewiston Dam. Although the number of spring-run spawning aggregations that were lost due to construction of the Snake River mainstem dams is unknown, the ESU still has a wide spatial distribution in a variety of locations and habitat types.

#### **4.3.1.2 The BRT Findings**

NOAA Fisheries recently conducted a status review of the SR spring/summer chinook salmon and other ESUs. As part of that status review, NOAA Fisheries convened a Biological Review Team (BRT) to evaluate the available scientific data. The BRT analysis included dam counts and spawner returns for natural-origin fish through 2001. As indicated in Section 1.0, NOAA Fisheries must examine the criteria for a sufficient number and distribution of viable salmonid populations (VSP) in order to assess the range-wide biological requirements of the ESU. The BRT did the same thing in assessing whether or not the ESU should be listed as an endangered or threatened species. In this case, the BRT found that, compared to the levels needed for a healthy species, there was a moderately high risk that the abundance and productivity criteria were not currently being met and a low risk that the spatial structure and diversity criteria were not currently being met. Concerns regarding diversity were somewhat alleviated, because out-of-ESU Rapid River broodstock had been phased out of the Grande Ronde. Despite the recent positive signs, the BRT still felt that the ESU was at some level of risk.

#### **4.3.1.3 2004 Status Review**

An indicator of the current range-wide status of this ESU is the number of spawners returning to natural production areas. In 1995, NOAA Fisheries established abundance levels for natural production areas that would be indicative of a recovered population (NMFS 1995), and these levels were updated as “interim abundance and productivity targets” in 2002 (NMFS 2002b). Many, but not all of the 29 extant natural production areas within this ESU have experienced large increases in the number of returning spawners in the last 2 to 3 years, with two populations (Grande Ronde and Imnaha) nearing the previously specified recovery abundance levels. Due to the severe declines in the populations since the 1960s and the short-term nature of the recent high returns, long-term productivity trends remain below replacement for all natural production areas, despite the recent increases. However, the short-term productivity trends for the majority of the natural production areas in the ESU are at or above replacement, which is a positive sign.

During the Status Review, NOAA Fisheries evaluated whether conservation efforts, such as the extensive artificial propagation program within this ESU reduced or eliminated the risk to SR spring/summer chinook. In performing this analysis, NOAA Fisheries was guided by the NMFS/USFWS “Policy for Evaluation of Conservation Efforts When Making Listing Decisions” (“PECE”; 68 FR 15100; March 28, 2003). NOAA Fisheries concluded that the artificial propagation programs did provide benefits to the ESU in terms of abundance, spatial structure, and diversity but that the programs had neutral or uncertain effects in terms of overall ESU productivity. As a result, NOAA Fisheries did not believe that the artificial propagation programs were sufficient to substantially reduce the long-term extinction risk of the ESU. Thus, even though the ESU is likely to benefit from strong upcoming brood years<sup>2</sup>, NOAA Fisheries

---

<sup>2</sup> That is, the upcoming brood years were derived from strong spawning escapements and improved conditions during the ocean phase of the life cycle.

proposed to retain the current listing of this species as threatened (i.e., likely to become an endangered species within the foreseeable future). Actions under the 2000 FCRPS Biological Opinion and improvements in hatchery practices are addressing some of the ESU's factors for decline.

#### **4.3.1.4 Recent Dam Counts and Returns to the Spawning Grounds**

Cooney (2004) updated the spawner count data used by the BRT (2003) for use by the Interior Columbia Basin Technical Recovery Team, adding data for 2002 and 2003, which he requested from the Comanagers. In general, for most of the 24 populations where recent data were available, indices of abundance (i.e., redd counts) for natural-origin SR spring/summer chinook were high in 2002 and 2003 compared to the 1990s. Fisher and Hinrichsen (2004) provided a preliminary evaluation of the effects of recent natural-origin spring chinook returns on past geometric mean abundance levels and population trends. The latter were calculated as the slope of the regression line for the (log transformed) index of abundance over time. They assessed whether the geomean was greater when calculated from the most recent data (beginning in 2001) compared to a base period (1996-2000) and whether the trend was greater when counts for 2001-2003 were added to the 1990-2000 data series. Their methods were taken from those used by NOAA Fisheries' BRT (2003). The geomean for 2001-2003 (33,581) exhibited a 548% increase over the 1996-2000 base period (5,186 fish). The slope of the trend for the natural-origin population increased 17% (from 0.97 to 1.14) when the data for 2001-2003 were added to the 1990-2000 series, reversing the decline and indicating that, at least for the short-term, the natural-origin population has been increasing. Hatchery fish constituted 69% of the return during the recent period compared to an average of 60% during 1990-2000 (Fisher 2004). Even so, natural-origin fish exhibited the substantial increase in numbers described above. Neither the BRT nor the Interior TRT has reviewed Fisher and Hinrichsen (2004) or Fisher (2004).

#### **4.3.2 SR Fall Chinook Salmon**

##### **4.3.2.1 ESU Structure**

A majority of the fish in this ESU spawn in the mainstem Snake River between the head of Lower Granite Reservoir and Hells Canyon Dam, with the remaining fish distributed among lower sections of the major tributaries (Connor *et al.* 2002). Fish in the mainstem Snake appear to be distributed in a series of aggregates from the mouth of Asotin Creek to River Mile (RM) 219, although smaller numbers have been reported spawning in the tailraces of the Lower Snake dams (Connor *et al.* 1993; Dauble *et al.* 1995). Due to their proximity and the likelihood that individual tributaries could not support a sufficiently large population, the Interior TRT (TRT 2003) considered these aggregates and the associated reaches in the lower major tributaries to the Snake to be a single population (Appendix B, Figure B.2). This is consistent with past practice in prior biological opinions.

Before European impact, Snake River fall chinook salmon are believed to have once occupied and spawned in the mainstem Snake River from its confluence with the Columbia river upstream to Shoshone Falls (RM 615). The spawning grounds between Huntington, Oregon (RM 328) and Auger Falls in Idaho (RM 607) were historically the most important for this species. Historically, only limited spawning activity occurred downstream of RM 273 (Waples *et al.* 1991), which is

about one mile below Oxbow Dam. However, development of irrigation and hydropower projects on the mainstem Snake River have inundated or blocked access to most of this area in the past century. Construction of Swan Falls Dam (RM 458) in 1901 eliminated access to 157 miles (about 25%) of total potential habitat, leaving 458 miles of habitat. Construction of the Hells Canyon Dam complex (1958-1967) cut off anadromous fish access to 211 miles (or 46%) of the remaining historical fall chinook habitat upstream of RM 247. Additional fall chinook habitat was lost through inundation as a result of the construction of the four lower mainstem Snake River dams. Currently, SR fall chinook salmon have access to approximately 100 miles of mainstem Snake River habitat, which is roughly 22% of the 458 miles of historic habitat available prior to completion of the Hells Canyon Complex and the four lower Snake River dams. Historical use of habitat in the Clearwater River is uncertain. Tiffan *et al.* (2001) concluded that there was “no conclusive evidence” whether the lower Clearwater River supported the basin subyearling migrant life-history pattern associated with Snake River fall chinook.

#### **4.3.2.2 The BRT Findings**

Approximately 80% of historical spawning habitat was lost with the construction of a series of dams on the mainstem Snake River. The loss of spawning habitat, restricting the extant ESU to a single naturally spawning population, increased the ESU’s vulnerability to environmental variability and catastrophic events. The diversity associated with populations that once resided above the Snake River dams has been lost, and the impact of out-of-ESU fish straying to the spawning grounds has the potential to further compromise the genetic diversity of the ESU. Although recent improvements in the marking of out-of-ESU hatchery fish and their removal at Lower Granite Dam have reduced the impact of these strays, introgression below Lower Granite Dam remains a concern. The BRT found moderately high risk for all VSP categories and therefore felt that, despite the recent positive signs, the ESU was at some level of risk.

#### **4.3.2.3 2004 Status Review**

During the Status Review, NOAA Fisheries evaluated whether artificial propagation programs within this ESU reduce or eliminate risks to its viability, guided by the PECE policy (Section 4.3.1). NOAA Fisheries concluded that the artificial propagation programs have provided benefits to the ESU in terms of abundance, spatial distribution, and diversity in recent years, although the contribution of these programs to overall ESU productivity is uncertain and the artificial propagation programs are not sufficient to substantially reduce the long-term risk of extinction. Depending upon the assumption made about the likelihood of the progeny of hatchery fish returning as productive adults, long- and short-term trends in productivity are at or above replacement. Thus, NOAA Fisheries proposed to retain the current listing of this species as threatened (i.e., likely to become an endangered species within the foreseeable future) even though it is not likely to go extinct in the near future. Actions under the 2000 FCRPS Biological Opinion and improvements in hatchery practices have provided some encouraging signs in addressing the ESU’s factors for decline.

#### **4.3.2.4 Recent Dam Counts and Returns to the Spawning Grounds**

Cooney (2004) reported that the high counts of natural-origin SR fall chinook continued in 2002 and 2003 (2,114 and 3,896 adults at Lower Granite Dam, respectively). In their preliminary analysis of recent returns, Fisher and Hinrichsen (2004) reported that the geometric mean abundance of naturally-produced fall chinook was 3,462 during 2001-2003, compared to 694 in 1996-2000 (a 398% increase). The slope of the population trend increased 8.0% (from 1.16 to 1.24) when the data for 2001-2003 were added to the 1990-2000 series. These results indicate that at least for the short-term, the population has been increasing. Approximately 64% of the aggregate run at Lower Granite Dam was hatchery fish in 2001-2003, compared to 67% during 1990-2000 (Fisher 2004).

#### **4.3.3 UCR Spring Chinook Salmon**

##### **4.3.3.1 ESU Structure**

The Interior TRT (TRT 2003) identified one major population group consisting of three demographically independent populations in the UCR spring chinook ESU (Appendix B, Figure B.3). Due to the relatively small size of the area, they did not identify any major groupings. Within the current boundary of the ESU, spring chinook are considered extirpated from the Okanogan drainage. The historical status of spring-run, stream-type fish belonging to this ESU in the Okanogan is uncertain. The Interior TRT could not determine definitively whether an independent population of UCR spring chinook existed there in the past but recognized the possibility that the area may have supported one. The construction of Grand Coulee Dam in 1939 blocked access to over 50% of the river miles formerly available to UCR spring chinook (NRC 1996). Tributaries in this blocked area may have supported one or more populations, but the lack of data on distribution and genetic makeup made it impossible for the Interior TRT to make any definitive determination.

##### **4.3.3.2 The BRT Findings**

The five hatchery spring-run chinook populations considered to be part of this ESU are programs aimed at supplementing natural production areas. These programs have contributed substantially to the abundance of natural spawners in recent years. However, little information is available to assess the impact of these high levels of supplementation on the long-term productivity of natural populations. The BRT (2003) concluded that spatial structure in this ESU was of little concern, because there is passage and connectivity among almost all populations. During years of critically low escapement (1996 and 1998), extreme management measures were taken in one of the three major spring chinook producing basins where all returning adults were collected and taken into the hatchery supplementation programs, reflecting the ongoing vulnerability of certain segments of this ESU. The BRT expressed concern that these actions, while appropriately guarding against the catastrophic loss of populations, may have compromised ESU population structure and diversity. The BRT's assessment of risk for the four VSP categories reflects strong concerns regarding abundance and productivity and comparatively less concern for ESU spatial structure and diversity (BRT 2003).

#### **4.3.3.3 2004 Status Review**

In its Status Review, NOAA Fisheries' assessment of the effects of artificial propagation concluded that the within-ESU hatchery programs do not substantially reduce the extinction risk of the ESU in-total (NMFS 2004b). Protective efforts, as evaluated pursuant to the PECE, did not alter NOAA Fisheries' assessment that the ESU is in danger of extinction or likely to become so in the foreseeable future. Actions under the 2000 FCRPS Biological Opinion, Federally-funded habitat restoration efforts, and other protective efforts are encouraging signs in addressing the ESU's factors for decline, but they do not as yet substantially reduce the ESU's extinction risk. Artificial propagation practices within the geographic range of the ESU do not fully support the conservation and recovery of UCR spring-run chinook. In particular, NOAA Fisheries is concerned that the non-ESU Entiat National Fish Hatchery has compromised the genetic integrity of the native natural population of spring-run chinook in the Entiat basin.

#### **4.3.3.4 Recent Dam Counts and Returns to the Spawning Grounds**

Cooney (2004) reported that natural-origin returns to the Methow subbasin in 2002 and to the Entiat and Wenatchee during 2002 and 2003 continued to exceed those observed during much of the 1990s. However, returns to the Methow declined during 2003. In their preliminary analysis, Fisher and Hinrichsen (2004) reported that the geometric mean of aggregate numbers of UCR spring chinook salmon increased 1,038% from 1996-2000 (4,959) to 2001-2003 (436 fish). The slope of the aggregate population trend increased 9.3% (from 1.00 to 1.10) when the data for 2001-2003 were added to the 1990-2000 series. These results indicate that, at least in the short-term, the aggregate population and the natural-origin populations in the Entiat and Wenatchee subbasins have been increasing.

#### **4.3.4 UWR Chinook Salmon**

##### **4.3.4.1 ESU Structure**

The Willamette/Lower Columbia River (W/LC) TRT (McElhany *et al.* 2004) identified seven demographically independent populations of UWR chinook salmon in a single major group (Appendix B, Figure B.4). All of these populations are extant, although they vary in degree of viability.

##### **4.3.4.2 The BRT Findings**

Numbers passing Willamette Falls have remained relatively steady over the past 50 years (ranging from approximately 20,000 to 75,000), but are an order of magnitude below the peak abundance levels observed in the 1920s (approximately 300,000 adults). The Clackamas and McKenzie river populations have shown substantial increases in total abundance since 2000. Trends in the other populations are difficult to determine. However, interpretation of the difference in abundance levels for the other populations remains confounded by a high but uncertain fraction of hatchery-origin fish.

The BRT estimated that, despite improving trends in total productivity since 1995, productivity would be below replacement in the absence of artificial propagation. The BRT was particularly concerned that a majority of the historical spawning habitat and approximately 30 to 40% of total historical habitat are now inaccessible behind dams. The restriction of natural production to just a few areas increases the ESU's vulnerability to environmental variability and catastrophic events. Losses of local adaptation and genetic diversity through the mixing of hatchery stocks within the ESU and the introgression of out-of-ESU hatchery fall-run chinook represent threats to ESU diversity. However, the BRT was encouraged by the recent closure of the fall-run hatchery and by improved marking rates of hatchery fish to assist in monitoring and in the management of a marked-fish selective fishery. The BRT found moderately high risks for all VSP categories.

#### **4.3.4.3 2004 Status Review**

There are no direct estimates of total natural-origin spawner abundance for the UWR chinook ESU. The abundance of the aggregate run passing Willamette Falls has remained relatively steady over the past 50 years (ranging from approximately 20,000 to 70,000 fish), but is only a fraction of peak abundance levels observed in the 1920s (approximately 300,000 adults). Interpretation of abundance levels is confounded by a high but uncertain fraction of hatchery produced fish. The McKenzie River population has shown substantial increases in total abundance (hatchery origin and natural origin fish) in the last 2 years, while trends in other natural populations in the ESU are generally mixed. With the relatively large incidence of hatchery fish spawning in the wild, it is difficult to determine trends in productivity for natural-origin fish.

Seven artificial propagation programs in the Willamette River produce fish that are considered to be part of the UWR chinook salmon ESU. All of these programs are funded to mitigate for lost or degraded habitat and produce fish for harvest purposes. During the Status Review, NOAA Fisheries' assessment of the effects of artificial propagation concluded that these hatchery programs collectively do not substantially reduce the extinction risk of the ESU (NMFS 2004b). An increasing proportion of hatchery-origin returns has contributed to increases in total ESU abundance. However, it is unclear whether these returning hatchery and natural fish actually survive over winter to spawn. Estimates of pre-spawning mortality indicate that a high proportion (more than 70%) of spring chinook in most ESU populations die before spawning. In recent years, hatchery fish have been used to reintroduce spring chinook back into historical habitats above impassible dams (e.g., in the North Santiam, McKenzie, and Middle Fork Willamette rivers), slightly decreasing risks to ESU spatial structure. Within-ESU hatchery fish exhibit different life-history characteristics from natural ESU fish. High proportions of hatchery-origin natural spawners in remaining natural production areas (i.e., in the Clackamas and McKenzie rivers) may thereby have negative impacts on within- and among-population genetic and life-history diversity. Collectively, artificial propagation programs in the ESU have a slight beneficial effect on ESU abundance and spatial structure but neutral or uncertain effects on ESU productivity and diversity. Protective efforts, as evaluated pursuant to the PECE, did not alter the assessments of the BRT and the Artificial Propagation Evaluation Workshop participants that the ESU is "likely to become endangered within the foreseeable future." The USFWS Greenspaces Program, the Oregon Plan, hatchery reform efforts, and other protective initiatives are

encouraging signs. However, restoration efforts in the ESU are very local in scale and have yet to provide benefits at the scale of watersheds or at the larger spatial scale of the ESU. The blockage of historical spawning habitat and the restriction of natural production areas remain to be addressed.

#### **4.3.4.4 Recent Dam Counts and Returns to the Spawning Grounds**

Fisher and Hinrichsen (2004) report that the preliminary geometric mean aggregate abundance of UWR chinook salmon in the Clackamas and McKenzie rivers is equal to 12,530 for 2001-2003 compared to 3,041 in 1996-2000, a 312% increase. The slope of the aggregate population trend increased 15.2% (from 0.89 to 1.02) when the data for 2001-2003 were added to the 1990-2000 series, reversing the decline and indicating that, at least in the short-term, the aggregate population has been increasing..

#### **4.3.5 LCR Chinook Salmon**

##### **4.3.5.1 ESU Structure**

The W/LC TRT (McElhany *et al.* 2004) identified a total of 23 extant, demographically independent populations in six major population groups: the Coastal Fall-run, Cascade Fall-run, Cascade Late Fall-run, Cascade Spring-run, Gorge Fall-run, and Gorge Spring-run (Appendix B, Figures B.5a and B.5b).

##### **4.3.5.2 The BRT Findings**

Abundance estimates of naturally produced spring chinook have improved since 2001 due to the marking of all hatchery spring chinook releases (compared to a previous marking rate of only 1 to 2%), which allows for the separation in counts at weirs and traps and on spawning grounds. Despite recent improvements, long-term trends in productivity are below replacement for the majority of populations. Of the historical populations, 8 to 10 have been extirpated or nearly extirpated. Although approximately 35% of historical habitat has been lost behind impassable barriers, the ESU exhibits a broad spatial distribution in a variety of watersheds and habitat types. Natural production currently occurs in approximately 20 populations, although only one population has a mean spawner abundance exceeding 1,000 fish.

The BRT expressed concern that most of the extirpated populations are spring-run, and the disproportionate loss of this life history type represents a risk to ESU diversity. Additionally, of the four hatchery spring-run chinook populations considered to be part of the ESU, two are propagated in rivers that, although they are within the historical geographic range of the ESU, probably did not support spring-run populations. High hatchery production poses genetic and ecological risks to the natural populations and complicates assessments of their performance. The BRT also expressed concern over the introgression of out-of-ESU hatchery stocks. The BRT found moderately high risk for all VSP categories.

#### **4.3.5.3 2004 Status Review**

In its Status Review, NOAA Fisheries notes that many populations within the LCR chinook ESU have exhibited pronounced increases in abundance and productivity in recent years, possibly due to improved ocean conditions. Abundance estimates of naturally-spawned populations have been uncertain until recently due to a high (approximately 70%) fraction of naturally spawning hatchery fish. Abundance estimates of naturally-produced spring chinook have improved since 2001 due to the marking of all hatchery spring chinook releases (compared to a previous marking rate of only 1 to 2%), which allows for the separation in counts at weirs and traps and on spawning grounds. Despite recent improvements, long-term trends in productivity through 2001 were below replacement for the majority of populations in the ESU. Of the historical populations, 8 to 10 were extirpated or nearly extirpated. Although approximately 35% of historical habitat is behind impassable barriers, the ESU exhibits a broad spatial distribution in a variety of watersheds and habitat types. Natural production occurs in approximately 20 populations, although as of 2001, only one population had a mean spawner abundance exceeding 1,000 fish.

Seventeen artificial propagation programs releasing hatchery chinook salmon are considered part of the LCR chinook ESU. All of these programs are designed to produce fish for harvest, and three of these programs are also intended to augment naturally spawning populations in the basins where the fish are released. These three programs integrate naturally produced spring chinook salmon into the broodstock in an attempt to minimize the genetic effects of returning hatchery adults that spawn in the wild.

During the 2004 Status Review, NOAA Fisheries' assessment of the effects of artificial propagation concluded that these hatchery programs do not substantially reduce the extinction risk of the ESU in-total (NMFS 2004b). Although the hatchery programs have been successful at producing substantial numbers of fish, thereby reducing risks to ESU abundance, their effect on the productivity of the ESU in-total is uncertain. Additionally, the high level of hatchery production in this ESU poses potential genetic and ecological risks to the ESU and confounds the monitoring and evaluation of abundance trends and productivity. The Cowlitz River spring chinook salmon program releases parr into the upper Cowlitz River basin in an attempt to reestablish a naturally spawning population above Cowlitz Falls Dam. Such reintroduction efforts increase the ESU's spatial distribution into historical habitats and slightly reduce risks to ESU spatial structure. The few programs that regularly integrate natural fish into the broodstock may help preserve genetic diversity within the ESU. However, the majority of hatchery programs in the ESU have not converted to the practice of regularly incorporating natural broodstock, thus limiting this risk-reducing feature at the ESU scale. Past and ongoing transfers of broodstock among hatchery programs in different basins represent risks to within- and among-population diversity. Collectively, artificial propagation programs in the ESU provide slight benefits to ESU abundance, spatial structure, and diversity but have neutral or uncertain effects on productivity.

NOAA Fisheries' assessment of the effects of artificial propagation concluded that the within-ESU hatchery programs do not substantially reduce the risk of the ESU in-total (NMFS 2004b). Protective efforts, as evaluated pursuant to the PECE, did not alter NOAA Fisheries' assessment that the ESU is "likely to become endangered within the foreseeable future." Planned dam



removals on the Sandy River, Federally funded habitat restoration efforts, the Washington Department of Natural Resources Habitat Conservation Plan, and other protective efforts are encouraging signs that the ESU's factors for decline are being addressed, but they do not as yet substantially reduce threats to the ESU.

#### **4.3.5.4 Recent Dam Counts and Returns to the Spawning Grounds**

Fisher and Hinrichsen (2004) compared the aggregate abundance of 41,450 during 2001 to a geomean of 11,135 for the years 1996-2000, a 272% increase. The slope of the aggregate population trend increased 6.6% (from 0.76 to 1.03) when the count for 2001 was added to the 1990-2000 data series, reversing the decline and indicating that, at least in the short-term, the aggregate population is increasing.

#### **4.3.6 SR Steelhead**

##### **4.3.6.1 ESU Structure**

The Interior TRT (TRT 2003) identified 23 populations<sup>3</sup> in six major population groups in this ESU: the Clearwater River, the Grande Ronde River, Hells Canyon, the Imnaha River, the Lower Snake River, and the Salmon River (Appendix B, Figure B.6). Like SR spring/summer chinook salmon, SR steelhead were blocked from portions of the upper Snake River beginning in the late 1800s and culminating with the construction of Hells Canyon Dam in the 1960s.

The SR steelhead ESU includes all naturally spawned populations of steelhead (and their progeny) in streams in the Snake River basin of southeast Washington, northeast Oregon, and Idaho (62 FR 43937; August 18, 1997).

NOAA Fisheries' June 14, 2004 listing proposal did not resolve the ESU membership of native resident populations that are above recent (usually man-made) impassable barriers but below natural barriers. It was provisionally proposed that these resident populations not be considered part of the revised SR steelhead ESU until such time as significant scientific information becomes available to afford a case-by-case evaluation of their ESU relationships. There was one exception in the listing proposal: recent genetic data suggest that native resident steelhead above Dworshak Dam on the North Fork Clearwater River are part of the ESU. However, NOAA Fisheries did not propose that hatchery rainbow trout introduced to the Clearwater River (and other areas within the ESU) be included in the ESU. The presence of six major population groups in this ESU means that it is less likely that any single group is significant for this ESU's survival and recovery, compared to ESUs with fewer major population groups.

---

<sup>3</sup> The Interior TRT (2003) identified one additional group of tributaries, Hells Canyon, which members thought was not large enough to support a demographically independent population.

#### **4.3.6.2 The BRT Findings**

The BRT (2003) noted that the ESU remains spatially well distributed in each of the six major geographic areas in the Snake River basin. However, the Snake River basin steelhead “B run”<sup>4</sup> was particularly depressed. The BRT was also concerned about the predominance of hatchery-origin fish in this ESU, the inferred displacement of naturally produced fish by hatchery-origin fish, and potential impacts on ESU diversity. High straying rates exhibited by some hatchery programs generated concern about the possible homogenization of population structure and diversity. However, recent efforts to improve the use of local broodstock and release hatchery fish away from natural production areas are encouraging. For many BRT members, the presence of relatively numerous resident fish reduces risks to ESU abundance but provides an uncertain contribution to ESU productivity, spatial structure, and diversity (NMFS 2003b; 2004a). The BRT found moderate risk for the abundance, productivity, and diversity VSP categories and comparatively lower risk in the spatial structure category.

#### **4.3.6.3 2004 Status Review**

The paucity of information on adult spawning escapement for specific tributary production areas in the SR steelhead ESU made a quantitative assessment of viability difficult. Annual return estimates are limited to counts of the aggregate return over Lower Granite Dam, and spawner estimates for the Tucannon, Grande Ronde, and Imnaha Rivers. The 2001 return over Lower Granite Dam was substantially higher relative to the low levels seen in the 1990s; the recent 5-year mean abundance (14,768 natural returns) approximately 28% of the interim recovery target level. The abundance surveyed in sections of the Grande Ronde Imnaha and Tucannon Rivers was generally improved in 2001. However, recent 5-year abundance and productivity trends (through 2001) were mixed. Five of the nine available data series exhibit positive long- and short-term trends in abundance. The majority of long-term population growth rate estimates for the nine available series were below replacement. The majority of short-term population growth rates (through 2001) were marginally above replacement or well below replacement, depending upon the assumption made regarding the effectiveness of hatchery fish in contributing to natural production.

There are six artificial propagation programs producing steelhead in the Snake River basin that are considered to be part of the ESU. Artificial propagation enhancement efforts occur in the Imnaha River (Oregon), Tucannon River (Washington), East Fork Salmon River (Idaho, in the initial stages of broodstock development), and South Fork Clearwater River (Idaho). In addition, Dworshak Hatchery acts as a gene bank to preserve the North Fork Clearwater River “B-run” steelhead population, which no longer has access to historical habitat due to construction of Dworshak Dam. During the Status Review, NOAA Fisheries’ assessment of the effects of artificial propagation concluded that these hatchery programs collectively do not substantially reduce the extinction risk of the ESU in-total (NMFS 2004b). Snake River basin hatchery programs may be providing some benefit to the local target, but only the Dworshak-based programs have appreciably benefited the total number of adult spawners. The Little Sheep Hatchery program is contributing to total abundance in the Imnaha River but has not contributed

---

<sup>4</sup> B-run steelhead have a 2-year ocean residence and larger body size and are believed to be produced only in the Clearwater, Middle Fork Salmon, and South Fork Salmon rivers.

to increased natural productivity. The Tucannon and East Fork Salmon river programs were only recently initiated and have yet to produce appreciable adult returns. Thus, the overall contribution of the hatchery programs in reducing risks to ESU abundance is small, and the contribution of ESU hatchery programs to the productivity of the ESU in-total is uncertain. Most returning Snake River basin hatchery steelhead are collected at hatchery weirs or have access to unproductive mainstem habitats, limiting potential contributions to the productivity of the entire ESU. The artificial propagation programs affect only a small portion of the ESU's spatial distribution and confer only slight benefits to ESU spatial structure. Large steelhead programs not considered to be part of the ESU occur in the mainstem Snake, Grande Ronde, and Salmon rivers and may adversely affect ESU diversity. These out-of-ESU programs are currently undergoing review to determine the level of isolation between the natural and hatchery stocks and to define what reforms may be needed. Collectively, artificial propagation programs in the ESU provide a slight beneficial effect to ESU abundance and spatial structure but have neutral or uncertain effects on ESU productivity and diversity.

#### **4.3.6.4 Recent Dam Counts and Returns to the Spawning Grounds**

The lack of information on adult spawning escapement to many tributary production areas makes it difficult to quantitatively assess the viability of the SR steelhead ESU. Estimates of annual returns are limited to estimates of aggregate numbers over Lower Granite Dam and spawner estimates for the Tucannon, Grande Ronde, and Imnaha rivers. Cooney (2004) reported continuing high returns of natural-origin SR steelhead (both A- and B-run fish) during 2002 and 2003 compared to those observed during much of the 1990s. In their preliminary report, Fisher and Hinrichsen (2004) estimated that the geometric mean of the natural-origin run was 37,784 during 2001-2003, a 253% increase over the 1996-2000 period (10,694 steelhead). The slope of the population trend increased 9.3% (from 1.00 to 1.10) when the counts for 2001-2003 were added to the 1990-2000 data series. These data indicate that, at least in the short term, the natural-origin run has been increasing.

#### **4.3.7 UCR Steelhead**

##### **4.3.7.1 ESU Structure**

The Interior TRT (TRT 2003) identified four historical, demographically independent populations in a single major population group in this ESU (Appendix B, Figure B.7). As described above for UCR spring chinook, the construction of Grand Coulee Dam in 1939 blocked access to over 50% of the river miles formerly available to UCR steelhead (NRC 1996). Tributaries in this blocked area may have supported one or more populations, but the lack of data on distribution and genetic makeup made it impossible for the Interior TRT to make a definitive determination.

The UCR steelhead ESU includes all naturally spawned populations of steelhead in streams in the Columbia River basin upstream from the Yakima River in Washington to the U.S.-Canada border (62 FR 43937; August 18, 1997).

NOAA Fisheries' June 14, 2004 listing proposal did not resolve the ESU membership of native resident populations that are above recent (usually man-made) impassable barriers but below natural barriers. It was provisionally proposed that these resident populations not be considered part of the revised UCR steelhead ESU, until such time as significant scientific information becomes available, thereby affording a case-by-case evaluation of their ESU relationships.

#### **4.3.7.2 The BRT Findings**

The BRT (2003) was concerned about the general lack of detailed information regarding the productivity of natural populations. The extremely low replacement rate of naturally spawning fish (0.25-0.30 at the time of the last status review in 1998) does not appear to have improved appreciably. The predominance of hatchery-origin natural spawners (approximately 70 to 90% of adult returns) is a significant source of concern for the diversity of the ESU and generates uncertainty about long-term trends in natural abundance and productivity. The natural component of the anadromous run over Priest Rapids Dam has increased from an average of 1,040 (1992-1996) to 2,200 (1997-2001). This pattern, however, is not consistent for other production areas within the ESU. The mean proportion of natural-origin spawners declined by 10% from 1992-1996 to 1997-2001. For many BRT members, the presence of relatively numerous resident fish reduced risks to ESU abundance but provided an uncertain contribution to ESU productivity, spatial structure, and diversity (NMFS 2003b; 2004a). The BRT found high risk for productivity and comparatively lower risk for abundance, diversity, and spatial structure.

#### **4.3.7.3 2004 Status Review**

In its Status Review, NOAA Fisheries reported that the last 2–3 years (through 2001) had seen an encouraging increase in the number of naturally produced fish in the UCR steelhead ESU. The 1996–2001 average aggregate return through the Priest Rapids Dam fish ladder (just below the upper Columbia steelhead production areas) was approximately 12,900 total adults, compared to 7,800 adults for 1992–1996. However, the recent 5-year mean abundances (through 2001) for naturally spawned populations in this ESU were 14 to 30% of their interim recovery target abundance levels.

Six artificial propagation programs that produce hatchery steelhead are considered to be part of the UCR steelhead ESU. These programs are intended to contribute to the recovery of the ESU by increasing the abundance of natural spawners, increasing spatial distribution, and improving local adaptation and diversity (particularly with respect to the Wenatchee River steelhead). Research projects to investigate the spawner productivity of hatchery-reared fish are being developed. Some of the hatchery-reared steelhead adults that return to the basin may be in excess of needs of the naturally spawning population in years when survival is high, potentially posing a risk to the natural-origin component of the ESU. The artificial propagation programs included in this ESU adhere to strict protocols for the collection, rearing, maintenance, and mating of the captive brood populations. Genetic evidence suggests that these programs remain closely related to the naturally spawned populations and maintain local genetic distinctiveness of populations within the ESU. Habitat Conservation Plans (HCPs) with the Chelan and Douglas Public Utility Districts and binding mitigation agreements ensure that these programs will have secure funding and will therefore continue into the future. These hatchery programs have undergone ESA Section 7 consultation to ensure that they do not jeopardize the recovery of the ESU and have

received ESA Section 10 permits for production through 2007. Annual reports and other specific information reporting requirements are used to ensure that the terms and conditions specified by NOAA Fisheries are followed. These programs, through adherence to best professional practices, have not experienced disease outbreaks or other catastrophic losses.

During the Status Review, NOAA Fisheries' assessment of the effects of artificial propagation concluded that hatchery programs collectively mitigate the immediacy of extinction risk for the UCR steelhead ESU in-total in the short term, but the contributions of these programs to the long-term survival and recovery of the species is uncertain (NMFS 2004b). The ESU hatchery programs substantially increase total ESU returns, particularly in the Methow basin, where hatchery-origin fish make up an average of 92% of all returns. The contribution of hatchery programs to the abundance of naturally spawning fish is uncertain, as is their contribution to the productivity of the ESU in-total. However, the presence of large numbers of hatchery-origin steelhead in excess of both broodstock needs and available spawning habitat capacity may decrease the productivity of the ESU. With increasing ESU abundance in recent years, naturally spawning, hatchery-origin fish have expanded into unoccupied spawning areas. Collectively, artificial propagation programs benefit ESU abundance and spatial structure but have neutral or uncertain effects on ESU productivity and diversity.

#### **4.3.7.4 Recent Dam Counts and Returns to the Spawning Grounds**

Fisher and Hinrichsen's (2004) preliminary estimate of the geometric mean of natural-origin UCR steelhead was 3,643 during 2001-2003 compared to 1,146 in 1996-2000, a 218% increase. The slope of the natural-origin population trend increased 9.2% (from 0.97 to 1.06,) when the data for 2001-2003 were added to the 1990-2000 series, reversing the decline and indicating, at least in the short term, that the run size has been increasing.

#### **4.3.8 MCR Steelhead**

##### **4.3.8.1 ESU Structure**

The Interior TRT (TRT 2003) identified 15 populations in four major population groups (Cascades Eastern Slopes Tributaries, John Day River, the Walla Walla and Umatilla rivers, and the Yakima River) and one unaffiliated independent population (Rock Creek) in this ESU (Appendix B, Figure B.8). There are two extinct populations in the Cascades Eastern Slope MPG, the White Salmon and Deschutes River above Pelton Dam.

The MCR steelhead ESU includes all naturally spawned populations of steelhead in streams from above the Wind River in Washington and the Hood River in Oregon (exclusive), upstream to and including the Yakima River in Washington, excluding steelhead from the Snake River basin (64 FR 14517; March 25, 1999).

NOAA Fisheries' June 14, 2004 listing proposal did not resolve the ESU membership of native resident populations that are above recent (usually man-made) impassable barriers but below natural barriers. It was provisionally proposed that these resident populations not be considered part of the revised MCR steelhead ESU until such time as significant scientific information becomes available, thereby affording a case-by-case evaluation of their ESU relationships.

#### **4.3.8.2 The BRT Findings**

The continued low number of natural returns to the Yakima River (10% of the interim recovery target abundance level, for a subbasin that was a major historical production center for the ESU) generated concern in the BRT. However, steelhead remain well distributed in the majority of subbasins in the ESU. The presence of substantial numbers of out-of-basin (and largely out-of-ESU) natural spawners in the Deschutes River raised substantial concern regarding the genetic integrity and productivity of the native Deschutes population. The extent to which this straying is a historical natural phenomenon is unknown. The cool Deschutes River temperatures may attract fish migrating in the comparatively warm Columbia River, inducing high stray rates. The BRT noted a particular difficulty in evaluating the contribution of resident fish to ESU-level extinction risk. Several sources indicate that resident fish are very common in the ESU and may greatly outnumber anadromous fish. The BRT concluded that the relatively abundant and widely distributed resident fish in the ESU reduce risks to overall ESU abundance but provide an uncertain contribution to ESU productivity, spatial structure, and diversity (NMFS 2003b; 2004a).

#### **4.3.8.3 2004 Status Review**

In its Status Review, NOAA Fisheries noted that the abundance of natural populations in the MCR steelhead ESU increased substantially in 2001 over the previous 5 years. The Deschutes and Upper John Day Rivers had recent 5-year mean abundance levels in excess of their respective interim recovery target abundance levels (NMFS, 2002). Due to an uncertain proportion of out-of-ESU strays in the Deschutes River, the recent increases in this population were difficult to interpret.

There are seven hatchery steelhead programs considered to be part of the MCR steelhead ESU. These programs propagate steelhead in three of 16 ESU populations and improve kelt (post-spawned steelhead) survival in one population. There are no artificial programs producing the winter-run life history in the Klickitat River and Fifteenmile Creek populations. All of the ESU hatchery programs are designed to produce fish for harvest, although two are also implemented to augment the naturally spawning populations in the basins where the fish are released.

During the Status Review, NOAA Fisheries' assessment of the effects of artificial propagation on ESU extinction risk concluded that these hatchery programs collectively do not substantially reduce the extinction risk of the ESU in-total (NMFS 2004b). ESU hatchery programs may provide a slight benefit to ESU abundance. Artificial propagation increases total ESU abundance, principally in the Umatilla and Deschutes rivers. The kelt reconditioning efforts in the Yakima River do not augment natural abundance but do benefit the survival of the natural populations. The Touchet River Hatchery program has only recently been established, and its contribution to ESU viability is uncertain. The contribution of ESU hatchery programs to the productivity of the three target populations and the ESU in-total is uncertain. The hatchery programs affect a small proportion of the ESU, providing a negligible contribution to ESU spatial structure. Overall, the impacts to ESU diversity are neutral. Collectively, artificial propagation programs in the ESU provide a slight beneficial effect to ESU abundance but have neutral or uncertain effects on ESU productivity, spatial structure, and diversity.

#### **4.3.8.4 Recent Dam Counts and Returns to the Spawning Grounds**

In their preliminary report, Fisher and Hinrichsen (2004) estimated a geometric mean of natural-origin MCR steelhead equal to 17,553 during 2001-2002 compared to 7,228 in 1996-2000, a 143% increase. The slope of the population trend for natural-origin fish increased 6.2% (from 0.99 to 1.05) when the data for 2001-2002 were added to the 1990-2000 series, reversing the decline and indicating that, at least in the short run, the natural-origin population has been increasing..

#### **4.3.9 UWR Steelhead**

##### **4.3.9.1 ESU Structure**

The UWR steelhead ESU includes all naturally spawned populations of winter-run steelhead in the Willamette River in Oregon and its tributaries upstream from Willamette Falls to the Calapooia River (inclusive) (64 FR 14517; March 25, 1999). The W/LC TRT (McElhany *et al.* 2004) identified four extant, demographically independent populations in one major population group (Appendix B, Figure B.9). NOAA Fisheries' June 14, 2004 listing proposal did not resolve the ESU membership of native resident populations that are above recent (usually man-made) impassable barriers but below natural barriers. It was provisionally proposed that these resident populations not be considered part of the revised UWR steelhead ESU, until such time as significant scientific information becomes available to afford a case-by-case evaluation of their ESU relationships.

This ESU does not include any artificially propagated steelhead stocks that reside within the historical geographic range of the ESU. Hatchery summer steelhead occur in the Willamette basin but are an out-of-basin stock that is not included in the ESU.

##### **4.3.9.2 The BRT Findings**

The BRT considered the cessation of the “early” winter-run hatchery program a positive sign for ESU diversity risk but remained concerned that releases of non-native summer steelhead continue. Because coastal cutthroat trout are dominant in the basin, resident steelhead are not as abundant or widespread here as in the inland proposed steelhead ESUs. The BRT did not consider resident fish to reduce risks to ESU abundance, and their contribution to ESU productivity, spatial structure, and diversity is uncertain (NMFS 2003b; 2004a).

The BRT found moderate risks for each of the VSP categories.

##### **4.3.9.3 2004 Status Review**

In its status review, NOAA Fisheries noted that approximately one-third of the LCR steelhead ESU's historically accessible spawning habitat is now blocked. Notwithstanding the lost spawning habitat, the ESU continues to be spatially well distributed, occupying each of the four major subbasins (the Molalla, North Santiam, South Santiam, and Calapooia rivers). There was some uncertainty about the historical occurrence of steelhead in drainages of the Oregon Coastal Range. Coastal cutthroat trout is a dominant species in the Willamette basin, and thus steelhead

are not expected to have been as widespread in this ESU as they are east of the Cascade Mountains.

#### **4.3.9.4 Recent Dam Counts and Returns to the Spawning Grounds**

In their preliminary report, Fisher and Hinrichsen (2004) estimated a geometric mean of natural-origin UWR steelhead at Willamette Falls equal to 9,541 during 2001-2004 compared to 3,961 in 1996-2000, a 141% increase. The slope of the population trend increased 10.4% (from 0.93 to 1.02) when the data for 2001-2004 were added to the 1990-2000 series, reversing the decline and indicating that, at least in the short run, the natural-origin population has been increasing.

### **4.3.10 LCR Steelhead**

#### **4.3.10.1 ESU Structure**

The LCR steelhead ESU includes all naturally spawned populations of steelhead in streams and tributaries to the Columbia River between the Cowlitz and Wind rivers in Washington (inclusive) and the Willamette and Hood rivers in Oregon (inclusive). Excluded are steelhead in the upper Willamette River basin above Willamette Falls and steelhead from the Little and Big White Salmon rivers in Washington (62 FR 43937; August 18, 1997). The W/LC TRT (McElhany *et al.* 2004) identified a total of 20 extant, demographically independent populations in four major populations groups: Cascade Winter-run, Cascade Summer-run, Gorge Winter-run, and Gorge Summer-run in this ESU (Appendix B, Figure B.10).

NOAA Fisheries' June 14, 2004 listing proposal did not resolve the ESU membership of native resident populations that are above recent (usually man-made) impassable barriers but below natural barriers. It was provisionally proposed that these resident populations not be considered part of the revised LCR steelhead ESU until such time as significant scientific information becomes available to afford a case-by-case evaluation of their ESU relationships. The presence of four major population groups in this ESU makes it is less likely that any single group is significant for this ESU's survival and recovery, compared to ESUs with fewer major population groups.

#### **4.3.10.2 The BRT Findings**

Approximately 35% of historical habitat has been lost in this ESU due to the construction of dams or other impassable barriers, but the ESU exhibits a broad spatial distribution in a variety of watersheds and habitat types. The BRT was particularly concerned about the impact on ESU diversity of the high proportion of hatchery-origin spawners in the ESU, the disproportionate declines in the summer steelhead life history, and the release of nonnative hatchery summer steelhead in the Cowlitz, Toutle, Sandy, Lewis, Elochoman, Kalama, Wind, and Clackamas rivers. Resident fish are not as abundant in this ESU as they are in the proposed steelhead ESUs. The BRT did not consider resident fish to reduce risks to ESU abundance, and their contribution to ESU productivity, spatial structure, and diversity is uncertain (NMFS 2003b; 2004a).

The BRT found moderate risks in each of the VSP categories.



#### **4.3.10.3 2004 Status Review**

In its Status Review, NOAA Fisheries noted that some anadromous populations in the LCR steelhead ESU, particularly summer-run steelhead populations, had shown encouraging increases in abundance in the 2 to 3 years ending 2001. However, population abundance levels remained small (no population had a recent 5-year mean abundance greater than 750 spawners).

There are 10 artificial propagation programs releasing hatchery steelhead that are considered to be part of the LCR steelhead ESU. All of these programs are designed to produce fish for harvest, but several are also implemented to augment the natural spawning populations in the basins where the fish are released. Four of these programs are part of research activities to determine the effects of artificial propagation programs that use naturally produced steelhead for broodstock in an attempt to minimize the genetic effects of returning hatchery adults that spawn naturally. One of these programs, the Cowlitz River late-run winter steelhead program, is also producing fish for release into the upper Cowlitz River Basin in an attempt to reestablish a natural spawning population above Cowlitz Falls Dam.

NOAA Fisheries concluded that these hatchery programs collectively do not substantially reduce the extinction risk of the ESU in-total (NMFS 2004b). The hatchery programs have reduced risks to ESU abundance by increasing total ESU abundance and the abundance of fish spawning naturally in the ESU. The contribution of ESU hatchery programs to the productivity of the ESU in-total is uncertain. It is also uncertain if steelhead reintroduced into the Upper Cowlitz River will be viable in the foreseeable future, because outmigrant survival appears to be quite low. As noted by the BRT, out-of-ESU hatchery programs have negatively impacted ESU productivity. The within-ESU hatchery programs provide a slight decrease in risks to ESU spatial structure, principally through the re-introduction of steelhead into the Upper Cowlitz River basin. The eventual success of these reintroduction efforts, however, is uncertain. Collectively, artificial propagation programs in the ESU provide a slight beneficial effect on ESU abundance, spatial structure, and diversity but uncertain effects on ESU productivity.

#### **4.3.10.4 Recent Dam Counts and Returns to the Spawning Grounds**

In their preliminary report, Fisher and Hinrichsen (2004) estimated that the aggregate abundance of LCR steelhead was equal to 4,429 during 2001 compared to 6,333 during the period 1996-2000, a 30% decrease in abundance. The slope of the aggregate population trend declined by 0.8% (from 0.93 to 0.92) when the 2001 count was added to the 1990-2000 data series.

### **4.3.11 CR Chum Salmon**

#### **4.3.11.1 ESU Structure**

The W/LC TRT (McElhany *et al.* 2004) identified a total of eight extant, demographically independent populations in three major population groups in this ESU: Coastal, Cascade, and Gorge (Appendix B, Figure B.11). Approximately 90% of the historical populations in the Columbia River chum ESU are extirpated or nearly so, and the Gorge population group was established by inferring that the approximately 100 adult chum salmon that ascend the Bonneville Dam fish ladders each year are spawning upstream. However, the Washington

Department of Fish & Wildlife (WDFW) found only one and two carcasses in its 2002 and 2003 spawning ground surveys in the Gorge area, respectively, and its radio-tag data indicate that at least some fish fall back downstream (Ehlke and Keller 2003). The Smolt Monitoring Program has no record of juvenile chum salmon at Bonneville Dam.

#### **4.3.11.2 The BRT Findings**

The loss of off-channel habitats and the extirpation of approximately 17 historical populations increase the ESU's vulnerability to environmental variability and catastrophic events. The populations that remain are low in abundance and have limited distribution and poor connectivity. The BRT found high risks for each of the VSP categories, particularly for the ESU's spatial structure and diversity.

#### **4.3.11.3 2004 Status Review**

In its Status Review, NOAA Fisheries noted that approximately 90% of the historical populations in the CR chum salmon ESU are extirpated or nearly so. During the 1980s and 1990s, the combined abundance of natural spawners for the Lower and Upper Columbia River Gorge, Washougal, Grays River populations was below 4,000 adults. In 2002, however, the abundance of natural spawners exhibited a substantial increase at several locations. The preliminary estimate of natural spawners in 2002 was approximately 20,000 adults. The cause of this dramatic increase in abundance is unknown. Improved ocean conditions, the initiation of a supplementation program the Grays River, improved flow management at Bonneville Dam, favorable freshwater conditions, and increased survey sampling effort may have contributed to the elevated 2002 abundance. However, long- and short-term productivity trends for ESU populations were at or below replacement. The loss of off-channel habitats and the extirpation of approximately 17 historical populations increase the ESU's vulnerability to environmental variability and catastrophic events. The populations that remain are low in abundance, have limited distribution and poor connectivity.

There are three artificial propagation programs producing chum salmon considered to be part of the Columbia River chum ESU. These are conservation programs designed to support natural productivity. The Washougal Hatchery artificial propagation program provides artificially propagated chum salmon for re-introduction into recently restored habitat in Duncan Creek, Washington. This program also provides a safety net for the naturally spawning population in the mainstem Columbia River below Bonneville Dam. That population can access only a portion of spawning habitat during low-flow conditions. The other two programs are designed to augment natural production in the Grays River and the Chinook River in Washington. All these programs use naturally produced adults for broodstock. These programs were only recently established (1998-2002), with the first hatchery chum returning in 2002.

NOAA Fisheries' assessment of the effects of artificial propagation on ESU extinction risk concluded that these hatchery programs collectively do not substantially reduce the extinction risk of the ESU in-total (NMFS 2004b). They have only recently been initiated and are just beginning to provide benefits to ESU abundance. The contribution of ESU hatchery programs to the productivity of the ESU in-total is uncertain. The Sea Resources and Washougal Hatchery programs have begun to provide benefits to ESU spatial structure through reintroductions of

chum salmon into restored habitats in the Chinook River and Duncan Creek, respectively. These three programs have a neutral effect on ESU diversity. Collectively, artificial propagation programs in the ESU provide a slight beneficial effect to ESU abundance and spatial structure but have neutral or uncertain effects on ESU productivity and diversity.

#### **4.3.11.4 Recent Returns to the Spawning Grounds**

In their preliminary report, Fisher and Hinrichsen (2004) estimated a geometric mean of the aggregate number of CR chum salmon in two index areas (Grays River and Hamilton and Hardy creeks) equal to 1,776 during 2001-2003 compared to 2,114 in 1996-2000, a 16% decrease. The slope of the aggregate population trend decreased 1.5% (from 1.02 to 1.00) when the data for 2001-2003 were added to the 1990-2000 series.

#### **4.3.12 SR Sockeye Salmon**

##### **4.3.12.1 ESU Structure**

Anadromous sockeye were once abundant in a variety of lakes throughout the Snake River basin: Alturas, Pettit, Redfish, Stanley, and Yellowbelly in the Sawtooth Valley and in Wallowa, Payette, and Warm lakes (Appendix B, Figure B.12), but the only remaining population resides in Redfish Lake. Beginning in the late nineteenth century, anadromous sockeye salmon were affected by heavy harvest pressures, unscreened irrigation diversions, and dam construction (TRT 2003). In addition, in the 1950s and 1960s, the Idaho Department of Fish & Game (IDFG) actively eradicated sockeye salmon from some locations.

The SR sockeye ESU includes populations of anadromous sockeye salmon from the Snake River basin in Idaho, though extant populations occur only in the Stanley Basin (56 FR 58619; November 20, 1991). The ESU also includes residual sockeye salmon in Idaho's Redfish Lake, as well as one captive propagation hatchery program. Artificially propagated sockeye salmon from the Redfish Lake Captive Broodstock Program are considered part of this ESU. NOAA Fisheries has determined that this artificially propagated stock is genetically no more than moderately divergent from the natural population (NMFS 2004b). Subsequent to the 1991 listing determination for SR sockeye, a "residual" form of Snake River sockeye (hereafter "residuals") was identified. The residuals often occur together with anadromous sockeye salmon and exhibit similar behavior in the timing and location of spawning. Residuals are thought to be the progeny of anadromous sockeye salmon but are generally nonanadromous. In 1993, NMFS determined that the residual population of Snake River sockeye that exists in Redfish Lake is substantially reproductively isolated from kokanee (i.e., nonanadromous populations of *O. nerka* that become resident in lake environments over long periods of time), represents an important component in the evolutionary legacy of the biological species, and thus merits inclusion in the SR sockeye ESU.

Only 16 naturally produced adults have returned to Redfish Lake since the Snake River sockeye ESU was listed as an endangered species in 1991. All 16 fish were taken into the Redfish Lake Captive Broodstock Program, which was initiated as an emergency measure in 1991. The return of over 250 adults in 2000 was encouraging; however, subsequent returns from the captive

program in 2001 and 2002 have been fewer than 30 fish. The BRT found extremely high risks for all four VSP categories.

#### **4.3.12.2 The BRT Findings and the 2004 Status Review**

There is a single artificial propagation program producing SR sockeye salmon in the Snake River basin. The Redfish Lake sockeye salmon stock was originally founded by collecting the entire anadromous adult return of 16 fish between 1990 and 1997, the collection of a small number of residual sockeye salmon, and the collection of a few hundred smolts migrating from Redfish Lake. These fish were put into a Captive Broodstock program as an emergency measure to prevent extinction of this ESU. Since 1997, nearly 400 hatchery-origin anadromous sockeye adults have returned to the Stanley Basin from juveniles released by the program. Redfish Lake sockeye salmon have also been reintroduced into Alturas and Pettit lakes using progeny from the captive broodstock program. The captive broodstock program presently consists of several hundred fish of different year classes maintained at facilities in Eagle, Idaho and Manchester, Washington.

NOAA Fisheries' assessment of the effects of artificial propagation on ESU extinction risk concluded that the Redfish Lake Captive Broodstock Program does not substantially reduce the extinction risk of the ESU in-total (NMFS 2004b). The Artificial Propagation Evaluation Workshop noted that the Redfish Lake Captive Broodstock Program has likely prevented extinction of the ESU. This program has increased the total number of anadromous adults, attempted to increase the number of lakes in which sockeye salmon are present in the upper Salmon River (Stanley Basin), and preserved what genetic diversity remains in the ESU. Although the program has increased the number of anadromous adults in some years, it has yet to produce consistent returns, and the long-term effects of captive rearing are unknown. The consideration of artificial propagation does not substantially mitigate the BRT's assessment of extreme risks to ESU abundance, productivity, spatial structure, and diversity.

#### **4.3.12.3 Recent Dam Counts and Returns to the Spawning Grounds**

In their preliminary report, Fisher and Hinrichsen (2004) estimated a geometric mean of aggregate numbers of SR sockeye salmon equal to 14 during 2001-2004 compared to 4 in 1996-2000, a 211% increase. However, because returns were higher in 2001 and 2002 than in 2003, the slope of the aggregate population trend decreased 3.7% (from 1.26 to 1.22) when the data for 2001-2004 were added to the 1990-2000 series.

### **4.3.13 LCR Coho Salmon**

#### **4.3.13.1 ESU Structure**

The W/LC TRT (McElhany *et al.* 2004) identified a total of 21 extant, demographically independent populations in three major population groups in this ESU: Coastal, Cascade, and Gorge (Appendix B, Figure B-13). There are only two extant populations in the LCR coho ESU with appreciable natural productivity, the Clackamas and Sandy river populations, down from an estimated 23 historical populations in the ESU.

#### **4.3.13.2 The BRT Findings**

Short- and long-term trends in productivity are below replacement. Approximately 40% of historical habitat is currently inaccessible, which restricts the number of areas that might support natural productivity and further increases the ESU's vulnerability to environmental variability and catastrophic events. The extreme loss of naturally spawning populations, the low abundance of extant populations, diminished diversity, and fragmentation and isolation of the remaining naturally produced fish confer considerable risks on the ESU. The lack of naturally produced spawners in this ESU is contrasted by the very large number of hatchery-produced adults. The abundance of hatchery coho returning to the Lower Columbia River in 2001 and 2002 exceeded one million and 600,000 fish, respectively. The BRT expressed concern that the magnitude of hatchery production continues to pose significant genetic and ecological threats to the extant natural populations in the ESU. However, these hatchery stocks collectively represent a significant portion of the ESU's remaining genetic resources. The 21 hatchery stocks considered to be part of the ESU, if appropriately managed, may prove essential to the restoration of more widespread naturally spawning populations. The BRT found extremely high risks for all VSP categories.

#### **4.3.13.3 2004 Status Review**

There are only two extant populations in the LCR coho salmon ESU with appreciable natural production (the Clackamas and Sandy River populations), from an estimated 23 historical populations in the ESU. Although adult returns in 2000 and 2001 for the Clackamas and Sandy River populations exhibited moderate increases, the recent 5-year mean of natural-origin spawners for both populations represented less than 1,500 adults. The Sandy River population had exhibited recruitment failure in 5 of 10 years (i.e., 1992-2001), and had exhibited a poor response to reductions in harvest. During the 1980s and 1990s natural spawners were not observed in lower basin tributaries. Coincident with the 2000–2001 abundance increases in the Sandy and Clackamas populations, a small number of coho spawners of unknown origin have been surveyed in some of these areas. Short- and long-term trends in productivity are below replacement.

Approximately 40% of historical habitat is currently inaccessible, which restricts the number of areas that might support natural production, and further increases the ESU's vulnerability to environmental variability and catastrophic events. The extreme loss of naturally spawning populations, the low abundance of extant populations, diminished diversity, and fragmentation and isolation of the remaining naturally-produced fish confer considerable risks. The paucity of natural-origin spawners is contrasted by the very large number of hatchery-produced adults. The numbers of hatchery coho returning to the lower Columbia River in 2001 and 2002 exceeded one million and 600,000 fish, respectively.

All of the 21 hatchery programs included in the LCR coho ESU are designed to produce fish for harvest, and two of the smaller programs are also designed to augment the natural spawning populations in the Lewis River basin. Artificial propagation in this ESU continues to represent a threat to the genetic, ecological, and behavioral diversity of the ESU. Past artificial propagation efforts imported out-of-ESU fish for broodstock, generally did not mark hatchery fish, mixed broodstocks derived from different local populations, and transplanted stocks among basins

throughout the ESU. The result is that the hatchery stocks considered to be part of the ESU represent a homogenization of populations. Several of these risks have recently begun to be addressed by improvements in hatchery practices. Out-of-ESU broodstock is no longer used, and near 100% marking of hatchery fish is employed to improve monitoring and evaluation of broodstock and (hatchery- and natural-origin) returns. However, many of the within-ESU hatchery programs do not adhere to best hatchery practices. Eggs are often transferred among basins in an effort to meet individual program goals, further compromising ESU spatial structure and diversity. Programs may use broodstock that does not reflect what was historically present in a given basin, limiting the potential for artificial propagation to establish locally adapted naturally spawning populations. Many programs lack Hatchery and Genetic Management Plans (HGMPs) that establish escapement goals appropriate for the natural capacity of each basin and that identify goals for the incorporation of natural-origin fish into the broodstock.

During the Status Review, NOAA Fisheries' assessment of the effects of artificial propagation on ESU extinction risk concluded that hatchery programs collectively mitigate the immediacy of extinction risk for the LCR coho ESU in-total in the short term, but these programs do not substantially reduce the extinction risk of the ESU in the foreseeable future (NMFS 2004b). At present, within-ESU hatchery programs significantly increase the abundance of the ESU in-total. Without adequate long-term monitoring, the contribution of ESU hatchery programs to the productivity of the ESU in-total is uncertain. The hatchery programs are widely distributed throughout the lower Columbia River, reducing the spatial distribution of risk from catastrophic events.

Additionally, reintroduction programs in the Upper Cowlitz River may provide additional reduction of ESU spatial structure risks. As mentioned above, the majority of the ESU's genetic diversity exists in the hatchery programs. Although these programs have the potential of preserving historical local adaptation and behavioral and ecological diversity, the manner in which these potential genetic resources are presently being managed poses significant risks to the diversity of the ESU in-total. At present, the LCR coho hatchery programs reduce risks to ESU abundance and spatial structure, provide uncertain benefits to ESU productivity, and pose risks to ESU diversity. Overall, artificial propagation mitigates the immediacy of ESU extinction risk in the short term but is of uncertain contribution in the long term.

Over the long term, reliance on the continued operation of these hatchery programs is risky (NMFS 2004b). Several LCR coho hatchery programs have been terminated, and there is the prospect of additional closures in the future. With each hatchery closure, any potential benefits to ESU abundance and spatial structure are reduced. Risks of operational failure, disease, and environmental catastrophes further complicate assessments of hatchery contributions over the long term. Additionally, the two extant naturally spawning populations in the ESU were described by the BRT as being "in danger of extinction." Accordingly, it is likely that the LCR coho ESU may exist in hatcheries only within the foreseeable future. It is uncertain whether these isolated hatchery programs can persist without the incorporation of natural-origin fish into the broodstock. Although there are examples of salmonid hatchery programs having been in operation for relatively long periods of time, these programs have not existed in complete isolation. Long-lived hatchery programs historically required infusions of wild fish in order to meet broodstock goals. The long-term sustainability of such isolated hatchery programs is

unknown. It is uncertain whether the Lower Columbia River coho isolated hatchery programs are capable of mitigating risks to ESU abundance and productivity into the foreseeable future. In isolation, these programs may also become more than moderately diverged from the evolutionary legacy of the ESU and hence no longer merit inclusion in the ESU. Under either circumstance, the ability of artificial propagation to buffer the immediacy of extinction risk over the long term is uncertain.

#### **4.3.13.4 Recent Dam Counts and Returns to the Spawning Grounds**

In their preliminary report, Fisher and Hinrichsen (2004) estimated a geometric mean of aggregate numbers of LCR coho salmon equal to 3,027 during 2001-2003 compared to 822 in 1996-2000, a 268% increase. The slope of the aggregate population trend increased 10.4% (from 0.92 to 1.02) when the data for 2001-2003 were added to the 1990-2000 series, reversing the decline and indicating that, at least in the short run, the aggregate run is increasing..